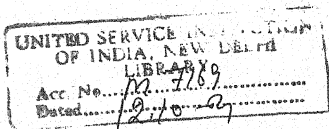


AIR POWER AND EXPANDING COMMUNISM

By

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PREFACE

A POPULAR theory about the origin of the war of 1939 is that it was caused by the capitalist system. Another popular theory is that it was caused by the innate aggressiveness of the German people. Yet another theory is that it was the outcome of a general moral decline. It would be in some ways satisfactory if any of these theories were right, for the evils of capitalism can be corrected, the aggressiveness of the Germans can be restrained and the peoples of the world can be morally elevated.

If, however, the real cause of war has not yet been discovered it becomes impossible to estimate the chances of preventing another. If the real cause is associated with a principle of growth and development; if war is part of the process of growth in communities, if it is a thrusting and elbowing for light and air, then war will not be prevented until growth has ceased. As death for the individual is sometimes pictured as a state of peaceful resolution and a final escape from strife; so—perhaps—death for the community may come when a single benevolent world state so orders the affairs of mankind that none is without food and drink, all are hygienically housed and clothed; all have work and leisure and all are cared for in sickness and in health. Perhaps that final cadence is what we are really striving for so desperately; perhaps that quiet evening and gentle full close is the ultimate purpose of all our frantic struggles. Perhaps humanity, like so many hard-working business men, will eventually feel that success has been achieved and that a quiet and pleasing retirement is permissible. And perhaps like so many hard-working business men it will find that after retirement death comes almost at once and equally unexpectedly.

For a mechanic such as I, speculation about the causes of war may seem effrontery. Such matters, it might be argued, can be adequately considered only by those trained in philosophy or in some other way specially fitted to take in the gigantic picture of world affairs. I know that this view will be held by many. Yet during thirty years my interest has been in aviation and the things that have impressed themselves upon me do so forcibly suggest the arguments I venture to put forward in the following pages, that I take the risk of being criticised as an interloping upstart and half-baked philosophical bounder. Each stage of World War II has seemed to me, in my capacity as a transport worker, to reveal or to emphasise a connection between transport and the growth of communities and therefore between transport and war.

It is, I repeat, a rash thing for an air pilot and "rude mechanical" to launch out on discussions of the underlying causes of the "things that great Ministers do" but I seek always to hold to the facts of war events and only secondarily to draw my special conclusions. I hope by this means not to give too much offence to the scholars and scientific workers.

My conclusions are negative. In fact, this book is largely a piece of destructive

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that transport and especially air transport is a stimulus to commerce; that war is part of the process of growth, another, yet bigger war, will follow World War II. But being too timid to stick to that hard conclusion, I have not been so diligent for some way out of the troubles into which my own theory has led me. I find one possible salvation. It lies in a new conception of the balance of power; a sense of responsibility towards all living things and an effort to strike a balance between them, even if it entails restricting some human activities.

Engineers and physicists and scientific workers in a host of fields have been the main-spring of industrialism; and industrialism, whatever its effects on human life, is an enemy to other kinds of life. The hideous industrial cities, the blackened areas, the polluted rivers, the slaughtered forests, the dust bowls, the factories, and all that goes with intense industrialism—whether its main object is the production of aircraft or ash-trays—these are enemies of life. Yet men and women sometimes seem to prefer them to life. I mean that men and women prefer to gather in these great industrial heaps and to earn their living by standing for a few hours a day at a machine, than to take part in the hazards and irregularities of any kind of agricultural work or to live in any agricultural community. Observations that have been made of the slum-dwellers of London who were bombed out and evacuated to the country villages, have indicated that they all want to go back to their slums at the earliest moment. If some better understanding of and responsibility towards all life, animal and vegetable as well as human, could be achieved or were achievable, then there might offer a better and war-less world. But our educationists do not teach responsibility towards life. They are concerned with reading and writing, the propaganda that is called history, myths and a hundred abstractions.

On this possible solution, this one hope of a war-less world which would still be a developing and not a dead world, I must say no more, for it is even more liable to lead me into trouble than the theory of the influence of air power on growing communities. But the question does keep cropping up as to whether we are going to let the machine run away with us or not; whether we are capable of stopping it running away with us. Perhaps we are not. Then my theory stands in its entirety. The world will go to a yet more intense industrialisation; the earth and the things that are found in it or grow upon it will be plundered to make more and more aircraft and ash-trays. Huge communities, all physically linked together by air lines, and intellectually by the radio will emerge and will clash in huger wars. Only when the last two tottering giants have met in battle can there be final resolution.

OLIVER STEWART

CHAPTER I

FROM the wounded fields of France in the summer of 1940 the cry came first: Give us aeroplanes. As the sun blazed down on the advancing Germans and the fleeing refugees; as the great French Army and Lord Gort's little British Expeditionary Force were borne back and down, divided and torn to pieces, the cry came in more and more agonising tones: Give us aeroplanes. It had come before from stricken Warsaw; but it had not then the frightful, fateful significance which it later acquired. It did not then sound a tragic warning to the peoples of the habitable universe. It came again—and now with more heart-rending urgency—from Greece and then from Crete as New Zealanders fought with bayonets against dive-bombers and as they sought to set forced marches against the high-speed movements of parachutists. It came from Malaya when the Japanese made their landings there in December of 1941. It came from the China seas as the *Prince of Wales*—latest and greatest British warship—and the *Repulse* went down. It came from the Indian Ocean as the *Dorsetshire*, *Cornwall* and *Hermes* sank. It came too, but in strangely different tones, from battered London in September 1940, as the German bombers began their systematic mutilations of the city and, it came from Bristol, Liverpool and Coventry. London made the call in different tones because London had watched the vacillations and shortsightedness of the politicians at close range, and it knew that the aeroplanes which it wanted so urgently did not exist and it knew the practical reasons why. It remembered more clearly perhaps than those in the "far-off lands" where the other German strokes had fallen, the administrations of Lord Baldwin and of Mr. Neville Chamberlain; it remembered the "years that the Locust hath eaten" to iterate the phrase of Joel first repeated by one of those most to blame for Britain's air weakness.

Give us aeroplanes! It was the cry of belated and desperate understanding. The power of the air had been dallied with by the politicians, glossed over by the Services, ignored by the public, misunderstood by the Press. Apart from a few men the truth about air power came only with war and then with stunning revelation. Even some who had paid aviation lip-service were startled by the reality of air power and stung by the crude efficiency of its challenge to all other power. But there was no further

doubt about air power after war broke out. The flames that were lit in Europe in 1939 and that swept round the globe until, by the end of 1941 all civilisation had been engulfed, threw up vast, lurid, ominous shapes against the sky. They were no mystic Horsemen, but aeroplanes, and in their tremendous significance to the history of metropolitan man they transcended the horrors and heroisms of actual conflict. The fighters on the field of battle, displaying their faithful courage, were as mites to the huge shadows of overhead power. Beyond that glare of life and death struggle the towering shadows moved and grotesquely enlarged some things and gave them a fearful suggestiveness. Past faults showed up and—unmistakably—there appeared the figures of future events. In nothing was this minatory and prophetic quality more marked than in the way it disclosed the part that aviation had played and would play in world events. Aviation influenced every step that led to world conflict; it dominated the battlefields wherever they were, and in the peace that follows it must again play the leading part in the readjustment and re-balancing of international and inter-continental power. It must be the monarch of peace as of war. The war of 1939 was not a war of explosives—like the war of 1914-18—not yet a war of chemicals as some had predicted; it was an air war. That is not to say that it showed the fullest possible development of air power, but that it was controlled and conditioned throughout by aviation. The air war revealed more things than how to wage war; it discovered more facts about the structure of a mechanistic civilisation than about the means of destroying it; it revealed with unexampled clarity and vividness the *communications basis* of the modern or expanding community. To trace down the statements of aviation and air power in this world war of 1939, and to grope for their strategical and economic bearing in both war and peace, and to seek from these things to create a guide—necessarily indistinct yet possibly stimulating—for the future is the aim of this book.

It was war that revealed the power of the air, and it was war that forced it upon the notice of those who had previously failed to see it. It was war that drove home to the minds of men the international, inter-continental and world significance of rapid movement. It was war that sorted out the relationship between land power and sea power and air power. But the revelations of war have their validity in peace. They have, indeed, continuous validity for a mechanistic world and for the expanding communities favoured and fostered by metropolitan man. At every stage of every battle aviation plays a part which has a wider and profounder meaning. War is

the revelation of air power, and the resolution of the problems of the use of air both in peace and in war. In order to show these things the foundations of the structure of reasoning must be laid in concrete events as the pursuance of a strategical plan must be built upon tactical success. Actuality as revealed in the official air war *communiqués* and in other documents is chosen as the basis upon which to raise a plan for air power in the future. The process of argument in these pages consists in three stages; first the historical outline of an event or series of events in air war as waged in the world conflict of 1939; second the inferences to be drawn from that event or series of events and, third, the constructive indications which arise from the two previous stages.

Thus the air war is treated in these pages in the form of a general historical survey; but the emphasis is uneven so that there may be a distortion, analogous to that found in a map projection, which will help in bringing to the notice the essential features which minister to the general argument. At each stage of the historical survey inferences will be drawn; but it will not be until the historical survey has been concluded that the final stage of constructive criticism will be reached. The book therefore contains two main parts, covering these three stages of argument; the first part historical and inferential; and the second constructive and prophetic. But the two are interwoven so that at all times there is a close liaison between the concrete fact and the theory; between the air operation and how the air forces engaged set about it and what happened during it, and the implications of those events as to tactical method and technical equipment.

Before I turn to those fateful days of 1939; to the heartburnings that afflicted so many in Great Britain as they sought to distinguish some profounder meaning; some sounder moral or material basis in the activities of Mr. Neville Chamberlain (only to be foiled again and again), before I turn to those amazing days of anguished waiting and wondering I must allude to the facts standing behind the world outlook on aviation. I must sketch in the basic structure, the longerons and main spars, the tie-rods and compression struts, which lay beneath and supported and gave shape to the way the peoples of all countries looked upon this form of transport. For it was this factual background that influenced, as will be seen when the incidents are recalled, every move in the opening stages of the war. It is only possible thus to interpret those days and the moves made by the various statesmen in their crackpot journeyings from capital to capital. In the next chapter, therefore, an attempt is made to assemble, as if in a museum, the aeronautical

exhibits of the time; to display in their appropriate *cases* the outstanding machines and organisations and to relate them to the expansion of communities. This chapter is meant to fix in mind the aeronautical skeleton on which the flesh of world events was hung. It is the skeleton as it stood before the war set it into horrible and accelerating motion.

CHAPTER II

THE history of metropolitan man has been the history of expanding communities. It is arguable that the basic value of aviation in both peace and war is derived from the tendency to expand exhibited by human aggregations. The expanding community is the star which guides the argument of this study. The expanding community is ministered to by aviation and given a fillip by aviation. To understand the noisy destructions of the war of 1939, and the quieter constructions of peace, the expanding community must be the constant reference and guide. It is necessary to examine it in this chapter and to fix it in mind so that future events may be referred to it. When the grand sweep of history is scanned the expansionist tendency of communities (using that term in the over-all sense covering military conquest, economic control, social influence and artistic dominance) is the most remarkable of all features. It seems that groups of men expand under a law which is as compulsive as that which promotes growth in the child. The child grows up and reaches manhood; the man associates himself with other men into groups, and these groups themselves grow and become tribes, counties, countries and continents. It is a rule at once grim and curious and it is associated with transport.

It had been stated that "transportation is civilisation," and in a vague manner the fact had been assimilated by the British people. Indeed it was their appreciation of the mainspring of their existence through the sea routes of the world that caused them at all times to look to the Navy as their first and last line of defence and to see that the needs of the Navy were given priority over all other needs. Is it too fanciful to suppose that the manner in which, between 1918 and 1939, the British people allowed their politicians to whittle into the Navy's strength was due, not so much to neglect and lack of interest in their country, as to a dim, confused, but growing belief that although transportation was still civilisation, and although the existence of Great Britain still depended on transport, transport oversea was no longer the absolute and unchallenged prerogative of the surface ship? Few people put this thought into words and those who did met instant refutation in the form of statements of tonnage. These statements showed that the loads carried by the largest aircraft in the world in 1939 were infinitesimal in size and significance compared with the loads carried every day, and all day, by the ships.

Peace, in short, did not fling up into high relief the factor of speed. Solemn commercial and economic computations showed that the cost per ton-mile of conveying goods in aircraft was enormously greater than the cost per ton-mile of conveying them in ships. It was likewise pointed out that there were not enough aircraft in the whole world to support the commerce of the country for a single day. It was mentioned that the largest successful aircraft working on the commercial routes of the world were incapable of dealing with much more than four or five tons of payload and that the biggest passenger-carrying machine, when working on a long haul, could not take more than twenty or thirty people in comfort. It was pointed out that there was no part of Europe in which air transport was paying its way or, in the words of Mr. Winston Churchill at an earlier period, "flying by itself." Imperial Airways Ltd. was subsidised by the Government of Great Britain. British Airways Ltd. was not at first directly subsidised but it, as well as some of the other smaller air transport organisations, received assistance in some other way, as for example in contracts for the carriage of mails. In brief, the general situation was that air transport was comparatively uneconomic, and that for that reason it could not compete with the older forms of transport by ship and by rail. That was the argument—yet the people of Great Britain, though they admitted the validity of the balance sheets and profit and loss accounts of the experts and although they agreed that aviation could not compare with shipping in the carriage of goods or people in a financially efficient manner, still felt dimly and obscurely that something had happened to the chain of communications between the mother country and the Dominions and other parts of the outside world. They felt that a great change was occurring, and although the experts proved that there was nothing in that instinctive feeling, the inarticulate mass of the public still kept it at the back of their great, solid heads. They still had it there when war broke out and, as will be seen in the next chapter, it influenced their every mood and every action.

The factual basis of civil air transport as at the outbreak of war was this: landplane services were running in many parts of Europe; flying-boat services were being developed by Britain on a large scale; the carriage of mails by air had been accepted as worthy of government support and subsidy; private flying existed but—when considered apart from the Civil Air Guard or organisations receiving some kind of Government subvention—it was on a very small scale and did not seem to know in what direction it was trying to go. In general subsidy was found to be needed for most

kinds of flying. Aircraft at this time had shown improvements compared with even four years ago. The Short Empire flying boats were among the best civil aircraft and gave to the eye of the imaginative beholder a hint of the things to come. Their riveted metal hulls and their comparatively large size made their relationship to the surface ship (the convergence of sea and air power) clear to the most casual observer. It is true that much bigger flying boats had been built, notably the Dornier DoX, but the Empire boats were the largest successful, working flying boats in regular service on any air line. Plans were also known to exist at this time for increasing the all-up weight of the flying boats and using them on the regular transatlantic service and for building new landplanes of greater size and power. The month before war broke out the general specification of the new Short transatlantic aeroplane had been announced. This aircraft was to be in two forms, one for normal height operation and the other for stratosphere operation. Its all-up weight was to be 71,000 lb., and its payload plus the crew 8,800 lb., or nearly four tons. It was to have four Bristol Hercules engines. The Air Ministry specification to which these designs were prepared called for a payload of 7,500 lb., a range of 3,000 miles against a 30 m.p.h. headwind, and a cruising speed of 275 miles an hour. In addition to these developments in large machines, there were developments in smaller machines for "feeder" line work. Most notable of these smaller machines—although not a complete success—was the de Havilland Flamingo which was introduced on the regular services between England and the Channel Islands.

In spite, then, of the general acceptance of the fact that air transport was uneconomic, some development *was* under way and the amount of interest the public took in these things was out of proportion higher than the actual work done—measured by ton-miles or on any other practical basis. Dimly the public was distinguishing the shape of things to come. It was peering anxiously forward and thinking and wondering. It was told that air transport was financially uneconomic; that if it wanted to keep its air lines running it must subsidise them; that no great weights could be carried by air (a misrepresentation urgently impressed on the public attention for many years); that flying was untrustworthy, unpunctual and dangerous. It accepted most of these things; yet it still wondered. It looked at the new aeroplanes built in Britain and in the United States of America, and it was fascinated by them. It exhibited a strong desire to learn about these new machines. It was perhaps the working of a national "instinct." Every

rational argument was against aviation; every statistical review forced upon the attention the fact that Great Britain lived by the sea and that her well-being depended on sea transport, and that air transport was merely a small and amusing but entirely insignificant (and exceedingly expensive) side-line. And yet . . . and yet . . . In the manner of the people towards aviation there seems to have been during this period a vaguely anticipatory quality. They listened to and acted upon the evidence of the experts and specialists, but their intuition told them to place a higher value on aviation than the economics of air transport suggested. They had an inkling that it is not only transportation that is civilisation; but a special kind of transportation; that another dimension had come into the picture. If there had been a great prophet at this time he would have seen and displayed to the world the true inwardness of the part aviation was playing and was to play in the world of the future, whether it was at peace or at war. For the thing could have been discovered by an act of reasoning. The deep, but confused faith which the public felt in aviation, and which they were instructed was irrational and not supported by statistical or economic evidence, that deep but confused faith was supported by statistical and economic evidence when all the facts were known; when all the dimensions were taken into account. It was like the description of an event in the pre-Einstein universe. There was a dimension left out, the "interval" which had to do with time. The arguments had not been based on full data or adequate experiment. And soon the experiment of war was to demonstrate the missing dimension; the dimension of time.

Social trends have been always towards an expanding community, expanding in space and contracting in time. The tribe turned into the nation, the county into the country, the country into the continent, the continent into the commonwealth. Throughout history this tendency of human communities to expand goes with easier and quicker communications. The cause is always transport and acceleration of transport.

The steps, indeed, in this progress have synchronised with steps in transport development. In the war of 1939 we saw one of the latest and greatest steps being made. Under our eyes a huge expansion of world communities was taking place, an expansion not instigated by Adolph Hitler, or Mussolini, or anybody else, but (as I guess) by a biological or sociological law which ordains that the human community shall expand and grow just as it ordains that the human body shall grow. It was an inevitable expansion though it might perhaps have taken place in a peaceful manner had the vast

implications been grasped by the peoples of the world, and had their understanding been directed by rationalists.

Distinguish, if possible, the major advances in the expanding community. We may, without being too fanciful, assume that the family was the first community. Then transport was by foot. Walking was the means of getting from one place to another and the only linkage between one family group and another. The first step forward, if this hypothesis be correct, would be when transport animals came into use and enabled goods to be carried and people to ride from place to place. We may assume that there was a period of development of the use of animal transport before the inevitable effect appeared and the family group expanded and became a tribal group. The improved communications enabled the tribal group to form and to hold together. Its original cement was animal transport. The next step would be vehicular transport, the introduction of the wheel. The wheel gave a first fillip to expansion and there arose the inarticulate demand for the bringing into the group of larger numbers of people, for the expansion of the group. The county barrier, which may be likened, though without strict accuracy, to the tribal barrier was found too close and narrow when the wheel brought wider visions with it. Wheel transport opened the eyes of the county groupings to the nation group, the group which embraced all the county or tribal sub-groups up to those natural features like oceans and mountain ranges, which formed barriers to the earlier forms of wheeled transport.

We have taken three steps forward in transport and two steps forward in the expanding communities. The substitution of animal transport for foot transport and the substitution of the tribal group for the family group; the substitution of wheeled transport for direct-lift animal transport and the substitution of the national group for the tribal group. We have moved from family to tribe and from tribe to nation; or from county to country. But all this time there were the seas as a barrier to transport and therefore to expansions which surpassed the land boundaries. The boat may be said to correspond to the wheel in its relation to water transport, but it could not at first have such an influence as the wheel on communities for the reason that the dangers of the seas were greater than the dangers of the land tracks or roads. The sea was a higher barrier to the expanding community than any land obstacles. The land obstacles in the course of the years were overcome so that nations arose with frontiers which ran, in most instances, along the sea-shores and the mountain ranges. The demand for the expansion and

growth of the community had been met by transport development up to the limits of land transport. (It may be held, of course, that the sequence should be that transport development brought about the demand for the expansion of communities and not the other way about; but there is no known means of determining with certainty the correct sequence, and the one here adopted need not lead to any false step in the reasoning.) The next stage was the development of sea transport. The great sea communities came into being, nourished by the blood of sea transport. The sailing ship enabled the expanding community for the first time to overstep the land barriers and to grow over and beyond the seas. But the growth was comparatively slow because the sailing vessel was as dependent upon the vagaries of its ocean tracks as were the early wheeled vehicles upon the vagaries of their land tracks. It was to the coming of steam that the over-sea expansion of communities was mainly due. The coming of steam was the first move in the breaking-down of *national* barriers.

Here it is necessary to recall once again that the economics of the matter have not had a decisive influence. The desires of human beings have out-ridden the economic limitations. It may with accuracy and with reason be said that walking is a more economic method of transport than riding; that riding is more economic than being carried in a wheeled vehicle with all its essential accessories of laid tracks and carriage equipment; that the sailing-ship, which derives its motive power from the winds, is more economic than the steamship. All this is true. The financial balance sheet always warns the human being against some forms of progress. It tells him that it will be costly. The financial experts and economists point to the improved rendering (when measured by their balance sheets) of walking over riding; of riding over going in wheeled vehicles; of sail over steam; but humanity responds to a deeper (if I am correct) and more forceful urge than that of creating satisfactory balance sheets. It responds to the urge to expand its communities as it responds to the urge to grow. The balance sheet goes by the board when these fundamental matters are in debate. So the steamship wins and the expanding community sees before it the prospect of growing still further and pushing out its frontiers over the seas so that nation is joined to nation and there comes into being the great union or commonwealth of nations.

Here we arrive, as is clear, at the world pattern which obtained at the time of the war of 1914-18. The progress of transport had been such that it opened the way to grander aggregations of human beings than then existed.

The point was not taken by the world's statesmen when war came. It was the response (again if I read the signs well) to the natural desire for growth and expansion and to the opportunity for the resolution of this afforded by transport progress. The nations felt their bonds and saw that greater fields existed for them and burst their bonds in an irrational and undirected struggle. They behaved just as the man confined in a small cell behaves if the agony of confinement overcomes him; he struggles and beats on the walls and dashes himself against the door. But there is this difference that the key is available to humanity at large if it looks for it; whereas the prisoner is at the mercy of his guards. Humanity at large, if it understood and allowed for the expansion of communities, might perhaps avoid major wars. But natural growth gives many examples of its strength and of the persistence and force with which it seeks to fulfil itself. The lowliest weed shows a sustained power when it seeks to overcome some confining influence which may have its analogue in human growth and in the growth of communities. They must grow; they must expand. If political or other bonds are placed around them they struggle to break them. They make war.

Now, in light of these things, look at the world of 1939. Again it seems that a state of transition had been reached but that its implications had not been understood. A new form of transport had developed to a point where, although it was not in wide use, it showed clearly its potentialities. This new form of transport had one quality of supreme importance when related to the inherent desire for growth in the human communities of the time; it had the power of overcoming all barriers, whether on land or water. For it used what the aeronautical pioneer, Sir George Cayley, called the "universal navigable ocean which comes to the threshold of every man's door." It used the element with which the entire habitable earth is encased, the air. To the peoples brought up in a sea tradition it was hard to recognise the change. It was especially hard on account of those limitations which applied to aviation in 1939; limitations of weight-carrying capacity; limitations of economic rendering. Nevertheless the fact was there; the age of transition had been reached; the old order of empires of the sea and of the community held together by sea and land links was in process of changing. The warring nations, if this view is right, were the blind instruments of world change; a change enforced by mechanical progress and especially by the development of human controlled flight.

Carrying is the basis of peace-time and of war-time cohesion. From land to sea to air. Those are the three paths, the three ways and in that order.

Great upheavals marked the transition stages of transport. When land transport was amplified by sea transport the convulsions shook the countries of the earth; when sea and land transport were amplified by air transport the whole world shook as the communities sought to expand through the air and to extend and to merge over areas vaster than anything previously covered. The very thoughts of the human race had to be freshly adjusted to grasp the scale-significance of the new transport and its opportunities. That was why it was a commonplace during the early stages of the war of 1939 to find people still thinking in terms much too small and restricted to meet the case so that each stroke in the conflict found them astonished at the width and breadth and depth of the conflagration.

Communities were struggling to burst their bonds and to expand with the aid of sea, land and air transport. Had the inner meaning of these forces been interpreted, statesmen might have arisen who would have devised a way of allowing for the inevitable, biological growth and expansion without slaughter. But no one saw, or rather no one related cause and effect. "Living room" was the cry of the Germans, but they did not see that for all countries the same need was felt and that it had less to do with raw materials and birth rates and the like, than with the opportunities to expand and grow held before the peoples of the earth by advances in transport and especially by the leap from land and sea up into the universal medium of the air. The reason there was no clear conception of what was the cause of the uneasy struggling of the communities during the years before war broke out was partly that air transport was so elementary. It was so little developed that only the eye of faith saw what it would be able to do. Reason did not proclaim as yet what faith felt, that we had reached a stage of further expansion. And it must be mentioned that although air transport played overwhelmingly the most important part in bringing about the pressures and desires that caused the wish for expansion to prevail, other things had also played a part. Electrical communications, for instance, had helped to bring about the conditions for struggle. Telephonic, telegraphic and radio communications had made one part of the world more conscious of the existence of the other parts. All this had contributed. But, if my view is correct, it was primarily the machine that provided physical transport, that enabled people and things to be carried over great distances at high speeds, that brought about the prevailing psychological tension of September 1939.

And now that I come to that date I turn to set out briefly the exhibits of 1939, the aircraft types which gave a measure of what had been done up to

then. Already some figures have been given for a new type of aircraft that was building, a long range, high flying transport aircraft. But this was not built. It was, in fact, to be diverted so that it became the Short Stirling heavy bomber, and perhaps it is not too fanciful to suppose that, as a heavy bomber, it performed that same biological function it would have performed had it gone through in its original design and become a long range transport machine. It helped to clear the way for an expansion of communities. After a few exhibits have been given to enable the reader

	<i>Loaded Weight (lb.)</i>	<i>Engines</i>	<i>Span ft. in.</i>	<i>Top Speed (m.p.h.)</i>	<i>Passengers</i>
A.W. Ensign	48,500	4	123 0	205	European 40 Empire 27
D.H. 91 Albatross	29,500	4	105 0	Cruising 210	Up to 30
D.H. Flamingo	17,600	2	70 0	239	12, 14 or 17
Empire "C" boats	40,500	4	114 0	200	17 day, 12 night
Douglas D.C.3	25,200	2	93 0	212	21
Douglas D.C.4	66,500	4	138 3	245	40
Focke-Wulf Condor	32,120	4	108 3	232	26
Dewoitine D-338	24,420	2	96 4	195	24
Nakajima A.T.	10,736	2	65 4	230	8

to have before him a brief summary of air-transport performance at the time of the outbreak of war, I turn to the air war itself treated as revelation. The air war showed what part air transport was playing in the struggle of all the communities of the world for expansion. These exhibits will show typical examples of various aircraft types and I have selected them so as to avoid special cases. But I should first interpose a word as to the thoughts of that time about development. It had gradually been accepted that the long-range, very large size aircraft was a type well suited to the marine group. So it came about that many of the long-range, large size aircraft in 1939 were flying boats. There was also at this time the belief that the small two- or three-seat aircraft was going to play a part resembling that which the motor-car had played, and that it would eventually be used in big numbers by private owners. The consequence was that this type of machine was built mainly to be cheap to buy and to run, and was of relatively low power so that it had no immediate successor in the military types that were to come

into full operation in the tremendous battles that were to follow. There were numerous intermediate classes; but, in Great Britain, at any rate, there was no bold and broad conception of air carrying on the grand scale. It was looked upon even by its most ardent supporters as a modest hand-
maiden to other forms of transport and regarded as primarily a means of rapid travel for the very rich and the very useless. On page 13 are the exhibits, tabulated so that they may be referred to at any stage in the subsequent story of air war and so that their performance may be related to that of the military aircraft which will be met in the subsequent pages. They are representative of their time and not exceptional. More advanced work was being done and on the Pacific run, for instance, the Pan-American Clippers were taking off at 86,000 lb. with fuel and oil weighing 24,000 to 29,000 lb. or from 27.9 to 33.7 per cent of the total. But the exhibits give an idea of the normal 1939 standards.

CHAPTER III

LONDON took on new life and meaning in the summer and autumn of 1940. Before then London had been known as the biggest and drabdest of the great capital cities of the world; a city of soot and slums; of smoke and traffic jams; of wealth without wisdom; of second-rate restaurants; second-rate transport; second-rate parks; second-rate architecture; second-rate statuary. Except as a centre of business it had nothing to recommend it, and its citizens, informed by the expanding network of radio and air communications, which brought them fuller and more immediate news of the rest of the world, were learning that the city they lived in and for whose creation and organisation they had some responsibility, was a poor thing compared with Paris or New York. Compared with Paris it was uncivilized and intolerant; compared with New York it was old-fashioned and uninteresting. People walked the glum streets of London glumly. They were not proud of their city or of the way its affairs were administered. Intolerance, obscurantism, bad taste, inhumanity: they were all to be found in quantity in London, whereas the finer freer qualities were not apparent. It took the bombs of the German air force in 1940 to infuse into London new meaning and new spirit. From the wreckage of buildings there bloomed not only many flora which were brought on the wind and found root among the debris; but also faith.

The assaults of the German air force on Britain began in August; but it was not until the 7th of September that they focused on London. On that evening those living in the city heard from high up in the blue sky the deep booming of many powerful aero-engines. It was as if, far up, beyond the reach of sight, countless express trains were tearing through the sky. Sometimes there was the higher pitched whine of diving single-seat fighters. The phenomenon of the high-speed aircraft's condensation trail became familiar to all. London looked up and then saw, here and there, a glint of sun on wings, heard the stutter of machine-guns, felt the thud of bombs, saw the puffs of anti-aircraft fire springing into being high over the city to hang poised in clusters while the battle moved on. London was the objective. From the upper floors of the tall houses around Kensington Gardens the fires could be seen starting before darkness fell. Later the sky glowed red so that it could be seen from miles away. Those who looked at that red canopy

from close at hand felt suddenly within their bones a profound stirring of pride and pity. London was burning. The flames seemed so high and appeared to stretch over such an immense area of dockland that human fire-fighting arrangements seemed puny and impotent. It was only a beginning. Night after night the bombs fell. London was the objective. The Ministry of Home Security estimated that the heaviest raid was on Tuesday night, the 15th October, when more than four hundred enemy aircraft attacked London from dusk to dawn. Between the 7th September and the 30th October, there were night raids on every night except two, and the average number of aircraft was about 200. Royal Air Force night fighters strove, but failed to check the enemy raiders; the anti-aircraft fire increased in volume, but did not appreciably deter the enemy captains and crews. London was the objective. London seemed open to the attack. It was as if she stripped her dirty, ugly old body naked for the nightly torture. And so it came about that feelings changed, ideas swung about, Londoners began to look upon London in a different way. "Paris," they said, "was declared an open town and saved all this," but they said it with pride in London and with pity for Paris. London began to assume a new mantle. Its dirty, scattered, higgledy-piggledy agglomerations of buildings, its inefficient streets, its ugliness, its smugness were covered and it began to appear as great as some of those who had sought to reduce it to order in the past had hoped it would be. It was an illusion of course. London was the symbol of unplanned, badly controlled, inefficient and unco-ordinated dumping. It never had any right in 1939 to be called a city. It was a rubbish dump, and nothing more. Yet when London became the objective of the German air force it was purified by fire and encased in a fantasy of affection and admiration. The cockney stayed put and began to work out his own estimation of the severity of the raiding. When huge buildings were laid flat, hundreds killed, immense fires started it was reckoned a "noisy night"—supreme example surely of the cockney meiosis. Wading to work through glass fragments Londoners looked around, nodded, and said, "The old lady was knocked about a bit last night." Probably a year before they would not have referred to their city in such terms of affection. It is true, of course, that the expression of opinion was often heard that the bombing, if it had not been for the loss of life, was doing useful "slum clearance" work; but the fact that Londoners still recognised the shortcomings of London's buildings and accommodation did not in the least conflict with their suddenly awakened affection. Air attack, by seeking to destroy the capital

of England, had given that capital a new lease of life and made it well-nigh indestructible; for it now existed not only as a heterogeneous grouping of houses and streets, but also as an *idea* in the minds of millions of men and women. Germany's air force had hit hard, but instead of disintegrating London the blows had compacted it and given it a firmness of its own.

Those attacks on London, together with the attacks on other cities, such as Coventry, Bristol, Liverpool, Plymouth, Birmingham, Hull, and many others, were the great air offensive of 1940. They remained until 1942 the high light of aerial action. They were of interest strategically, tactically, and psychologically. But before them and after them the air had been playing its part in numerous operations in many theatres. Day by day as the war proceeded that part grew in importance. In 1942 Lord Trenchard, in a statement in the House of Lords, expressed the view that air should always dominate strategy. It was not at the time a very exact statement, because the strategy of the British Commonwealth had inevitably (for reasons of supply) to be based on sea strategy and air had to be co-ordinated with sea strategy. That condition must remain for an island nation until such time as a large part of the carrying of supplies can be done by air instead of by sea. Nevertheless Lord Trenchard's remark condensed into a brief sentence the undoubted fact that the power of the air must be considered in every strategical discussion. Or in other words strategy had become three dimensional instead of two dimensional. That is the more exact though less readily publicised method of stating what had occurred. Strategy is three dimensional instead of two dimensional; it follows therefore that in all land or sea operations the air must be taken in as part of the whole picture. But there is more in it than that, and the following remarks will it is hoped, indicate the larger meaning of the coming of air power. It is not only that the coming of air power converted all strategy to three dimensional strategy; but also that the coming of air power—both military and civil—gave rise to the conditions which brought about the war itself. I accuse aviation of being the primary cause of the war of 1939, though with it must be grouped all other means of swift inter-continental communication, such as the radio and the cable. Aviation, however, did not cause the war because it offered a powerful method of striking blows at an enemy, but because it promised and provided for an expansion of community thought and community desires. It held out before men the great vista of material possibilities that had—when communications were more restricted—been

hidden from them. No sooner were the world's riches laid out on a counter by quick and comprehensive communications, than the desire was born in many peoples to partake of them and to taste the prodigious luxuries which seemed to be enjoyed by other nations. The coming of wireless communication had not sharpened this desire so much as the coming of air communication because the voices that came over the air were thin, ghost voices. It was possible then for those who heard them to think of them as coming from an unreal world of dreams. But when travel itself was subjected to the sharp accelerations brought about by the introduction of air travel; when the spanning of the Atlantic ocean—barrier between the hypertrophied wealth of filmic concepts and the drab existence of middle Europe—was converted from a matter of days into a matter of hours; when the time taken was divided by twenty or so, and when it was possible to convey people and things so that there could no longer be doubt about the reality of the worlds across the water, then there came the biologically based instinct to expand. Communities recognised that another great step in the evolution of the world had to be taken. Like the baby which casts its arms and legs about, seeking movement and the expansion of its being, so the great nations were casting about vaguely and uneasily, impelled by a dark—because undefined—force.

So now the hour strikes. The pent up forces which aviation has brought into being burst their bonds. The nations, impelled by unformulated desires and wishes, but believing in their respective "gods" of freedom and a new order, clash. Aviation, which has brought about the unbalanced pressures which have led to war, must now play its part in the final arbitrament. Aviation which has produced international restlessness, must now resolve it with blood and bombs. Aviation which has made possible another great expansion in the size of the communities of the world must crash down the old barriers and by searing the earth clear the way for the greater communities dictated by biological forces neither understood nor controlled. It is one of the great transition stages of world history. Mark it down with the transition stage from cave to village; from tribe to nation; from nation to commonwealth. The forces rush together; mechanical instruments of unbelievable force and violence interlock and grind one another. A glance at the last days of peace when a few men thought they could hold up the armies of evolution and then to the day of the declaration of war and that historical first air raid warning which sounded in the London area half an hour after Mr. Neville Chamberlain on Sunday, 3rd

September 1939, in wavering tones, had told on the wireless how Great Britain had been at war with Germany since 11 a.m.

Fishing in Scotland was the activity of the Prime Minister, Mr. Neville Chamberlain on the 20th August 1939, when there came from Berlin the claim for the first time, not only to the Port of Danzig, but to all territories lost by Germany in 1919, including the Polish Corridor with a 90 per cent Polish population. Aviation during these last few days of peace ministered to the movements of ministers. Herr von Ribbentrop flew to Russia on the 23rd August and there the Russo-German pact was signed. This was the final flying prelude to war, being an extension of the aerial trips made by the British Prime Minister to visit Herr Hitler just before. Herr von Ribbentrop's journey was followed almost at once, on the 30th August, by his summons to the British Ambassador to Germany to visit him in Berlin, and by his rapid reading to the astonished and for the first time comprehending Sir Nevile Henderson of the terms which—it was said—Germany would have demanded had a Polish plenipotentiary been sent to Berlin. On the next day the Germans contrived an incident which expressed confidence in their own omnipotence. M. Lipski, the Polish Ambassador in Berlin, asked to see Herr von Ribbentrop. He was asked if he was acting as Ambassador or plenipotentiary, and on reply that he was acting as Ambassador, no interview was accorded him. At the same time he was called to the German Foreign Office and told the terms that the Germans wished to impose upon his country. The invasion of Poland took place on the next day, the 1st September 1939, a Friday. Poland invoked the Anglo-Polish Treaty and at once came the first sign of the power of the air for London and other cities in Britain began to evacuate their women and children. On the same day it was announced in Warsaw that the Germans had made air raids on five towns.

Now all eyes turned to the Royal Air Force. The British public had confidence in it. It had learned to admire its flying and the quality of its aircraft. It had formed a shrewd idea of its efficiency from the Air Force Displays to which it had yearly been admitted and from the other and more recent public occasions such as those held as part of Empire Air Day. Interest in the progress of the Royal Air Force had been widespread. It had been accepted that it had the fastest fighting aircraft of any country in the world and it had been accepted that some of its heavy bombers had a longer range for a greater bomb load than any others. The Royal Air Force pilots and air-crew members were held to be in the same tradition as those of the

Royal Flying Corps and the Royal Naval Air Service of the war of 1914-18, and they were generally believed to be as efficient and as well trained as such personnel can be. There was great faith in the power of the British air arm, and only on one point had there been much criticism during the days preceding the war, that was the question of whether the Royal Navy and the Army were in a position to provide themselves with adequate air support. Officially there had never been a quarrel or even the slightest disagreement between the staffs of the three services on these points. Officially the Royal Navy had been entirely satisfied with its limited Fleet Air Arm and the Army with what co-operation the Royal Air Force could accord it. Unofficially there was a great deal of bickering, and in fact, the official aspect was a false façade behind which there was uneasiness, criticism and even quarrelling. But this did not shake public confidence in the Royal Air Force. The public, however, did not know much of those who were in command. In fact among the air leaders the name of Lord Trenchard, who was no longer on the active list, was probably at this time the only one generally known. But the Royal Air Force had built up its following and there was a general feeling that it would put up a stout defence and would be able to hit back at the enemy with good effect. So when Poland was attacked and there occurred that pregnant interval of two days before Britain had actually declared war, but after it had become clear that war was inevitable, the Royal Air Force was in the thoughts of many citizens, and there were many who put their faith in it. But it is also true that there had been wide pre-war publicity for the views of General Giulio Douhet and all those who, like this Italian General, believed that decisive blows could be struck from the air by bombing attacks on cities. Many books had been published suggesting that London might be laid flat in a short space of time by aerial bombing, or its inhabitants wiped out by poison gas laid by aircraft.

It is difficult to look back and to recover the national beliefs about the power of the air arm in those critical days; beliefs which were to undergo gradual modification by subsequent events. But it is certain that the inhabitants of the big cities of Britain, when they knew that war was upon them, unconsciously looked up into the sky. That automatic glance up into the sky was the outward sign of inner beliefs and convictions that were soon to be tested. From the sky it was expected that the first tremendous blows would come; from the sky it was thought Britain would strike back at Germany. Danger seemed to lurk high up in the blue. Nor must it be thought that these feelings were experienced by the uninstructed alone;

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professional soldiers, sailors and airmen shared them, and in the Higher Command of the Royal Air Force there was no precise knowledge of the limitations of air bombardment. Nor, when the Germans struck by these means at Poland, did clearer views prevail. The first month of war saw many aerial attacks on cities in Poland. Warsaw received the heaviest raids then Vilno and Lwow, with places like Posen and Cracow also. But it must be confessed to-day that a true appreciation of what the Poles were suffering from these aerial attacks did not percolate through to England. The attacks were underrated; the Polish reports of the destruction of German aircraft were overrated. Nothing came through of the numbers of Polish aircraft that were destroyed on the ground—indeed the silence of the Poles on this set the note for future British *communiqués* which did not mention aircraft lost on the ground. When the Poles reported that Berlin had been raided by their aircraft there was a tendency to think that the power of the raiding was evenly balanced. In short it was not until direct experience had taught them, that the people of Great Britain (or other countries outside Poland for that matter) learned the measure of air raiding. Let it be repeated that the Air Staff were not much better informed. British air policy for aiding Poland consisted during this first month when the German air force was ravaging Poland, of leaflet raids. In the regions of Bremen, Hamburg, Frankfort, Cologne leaflets were dropped. Those twin-engined bombers in which the British public reposed such faith on account of their hitting power, the Vickers-Armstrongs Wellington and the Armstrong Whitworth Whitley were devoted to the dropping of leaflets.

Bombing policy is one of the things that must crop up again and again in this narrative. So let it be noted well that at this early stage of the war the public was puzzled by British bombing policy. It was desperately anxious that we should help Poland, yet all that we did was to drop leaflets . . . all that we did, that is, except for the famous Wilhelmshaven raid, details of which were given out by the Ministry of Information on the 4th September 1939. This raid aroused hopes and comment out of all proportion to its effect. It inspired much praise and a newsreel constructed a brief sequence to commemorate it. When this newsreel was shown loud applause was usually heard. It was the beginning of the realisation of a hope doomed to subsequent disappointment, the hope that the Royal Air Force could strike at Germany so often and so heavily as to damage seriously and quickly her power of making war. Kiel, however, was not an exception to the bombing policy laid down, which was not to bomb land targets in Germany.

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The Kiel attack was directed at German warships at Wilhelmshaven and Brunsbüttel and not at land targets. A few people in Britain called loudly and long for bombing attacks on targets in Germany. But their demands had no effect in altering Government policy. We must see in this restricted bombing policy an extension of the conciliatory actions of the British Government then in power with Mr. Neville Chamberlain at its head. It was the logical sequel to appeasement. Another point which demands record is that on the same day as that on which the Kiel raid was announced, the 4th September, the Warsaw broadcasting station said that German parachute troops had landed behind the Polish lines.

So here, in these first few days of war, there was a significant pattern. The salient features of the pattern were the German attacks on cities in Poland and the German use of aircraft in Poland to strike at the Polish air force and to land parachutists at points where they could outflank Polish land forces. It was the first instance of vertical outflanking in military history. In brief the Germans were already using their air force in the manner they were to repeat again and again in the future; while Britain was also beginning in the same way to employ the method that was to characterise her air operations for a long time to come. Let us seek to sum up the position in few words so that it may be seen in distinct, but compact and concise form.

Germany was deploying her air force to the immediate support of her army in the field. She was not raiding Britain or France and her only activities over those countries consisted of reconnaissance flights—sometimes armed reconnaissance flights. Britain and France were waiting and watching, believing either that Poland would hold out for some time or, if she went down quickly, that her defences were inadequate. Germany's air policy was one of absolute concentration on the area of land operations; Britain's air policy was that of diffusion over enemy territory in general.

The measure of the effectiveness of the German concentrated collaboration with the land forces was to be seen in the rapid overrunning of Poland. The measure of the effectiveness of the British policy of diffusion over enemy territory in general was to be seen in the dispersed leaflet raids and in the single raid which came to be known as the Kiel raid. The results of the German policy were clearly proclaimed by German successes. German aircraft went on ahead of German troops, sweeping a way for them, shutting down resistance, knocking out the network of supply and communication. Warsaw was bombed with increasing violence from the moment when German troops began to threaten it, up to the time of its fall. Towards the

end of September 1939 the bombing became almost continuous and on the 25th September the German *communiqué* stated that it included dive-bombing. Civilian losses mounted and were stated by Warsaw to include more than 1,000 killed on the 24th September. The Warsaw *communiqué* on the 27th September stated that seventy German aeroplanes had circled the city and that bombing had been uninterrupted. High explosive and incendiary bombs were mixed. On this day the Warsaw defenders stated that eight German aircraft had been brought down. But they added that they could no longer continue the struggle. It was a warning that ought to have attracted much more attention than it did. The feeling in Britain was not so much that a striking example had been given of the power of aerial bombing, especially in the daylight, when it formed part of an operation in which ground troops were taking part, as that the weakness of the Polish defences had been exposed. Later Britain was to know that the strength of the German air-land attack was being proved rather than the weakness of the defenders. But the Service chiefs in Britain did not show any marked signs of having appreciated this by their subsequent dispositions. The truth seems to have been that a formula of air-land collaboration was being used by the Germans with good effect, but that it was a formula whose full significance eluded many expert observers at the beginning. At any rate Britain's subsequent air policy was not apparently affected by the fall of Warsaw and the manner in which this had been brought about. Another matter which began to emerge from the German campaign in Poland was the scale of air operations as conceived by the Germans. M. Giraudoux, who was the French Commissioner-General for Information at the time, estimated the German losses in Poland at 400 to 600 aeroplanes. It was to be seen later that such losses spread over such a period were within the German output capacity and within the immediate reserves of the German air force. At the time, however, they seemed big. While events in Poland were not assessed at their full magnitude, events nearer home were over-estimated and over-emphasised. For appreciation of this point reference must again be made to the Kiel raid.

It was made by aircraft which took off towards the evening on the 4th September and it was made from a low level. The attack was led by Flying Officer K. C. Doran, who, with Flying Officer Andrew McPherson received the Distinguished Flying Cross; these being the first two D.F.C.s awarded in the war. The attack was pressed home and hits were obtained on German warships, one of them, according to subsequent report, being

the *Gneisenau*. The raid gave rise to a vigorous propaganda contest in which Germany sought to prove that no damage had been done and brought to the microphone some of the air-crew members they had captured, while the Ministry of Information sought to emphasise the success of the raid. Only after the much heavier raids of subsequent periods was this early attack seen in true perspective as a very small, though very gallant, raid which could not possibly have been expected to do more than slight damage to the enemy. So here from the early days of the war the outline began to show through of the pattern of air operations. The German concentrated collaboration between air forces and land forces; the British diffusion and independence of air forces. It was difficult to see it at the time, but it later also became clear that leaflet raiding was not likely to be effective at a moment when the Germans were wholly victorious and when they had not been seriously tried by privations or failures of any kind. But leaflet raiding did, perhaps, act as a form of training and as it caused the loss of few machines it may perhaps be justified on that account. General Field Marshal Göring referred to the leaflet raids with derision; but they began to show that his earlier boasts of the effectiveness of the German air defences were ill-founded, a thing to be finally demonstrated by Bomber Command in the summer of 1943. He threatened retaliation with bombs if Britain bombed Germany. It was seen later that this much publicised statement was intended to ward off the bombing of Germany, of which the Germans were then very sensitive, as long as possible, and so to enable the policy of concentrated collaboration to be continued. The Germans did not want Germany bombed when Britain and France both had bases close to her and when the German air force was busy on its concentrated collaboration with the German army in Poland. Germany, in brief, was concentrating not only her forces, but also her propaganda upon a clearly seen end.

Two more events from these early stages of the air war must be noted and then it will be my endeavour to bring the inferences together and to look at the picture of those opening days critically yet impartially and to distinguish what truths emerge from studying them. The other two events occurred on the 18th September when two announcements were made, the first that a Royal Air Force aircraft had sunk a German submarine and the second that the British aircraft carrier *Courageous* had been sunk on the previous Sunday. The *Courageous* was built in 1917 as a cruiser and later converted to become an aircraft carrier. She could take a complement of 48 aeroplanes, and of her 1,200 officers and men about 700 were saved. These two events are

mentioned here because they mark a beginning of the air-sea war which was to continue and to extend right up to the time when Japan came in on the side of the Axis powers and used her aircraft carriers for air attacks on such places as Pearl Harbour and later Colombo (on Easter Sunday the 5th April 1942) in Ceylon. At the time of the attack on the *Courageous* the concept of the use of an aircraft carrier was that of defence. The *Courageous* had been mainly engaged on anti-submarine patrol work. The first sinking by the Royal Air Force of an enemy submarine was the prelude to many other sinkings. Coastal Command later intensified its protective activities and made submarine chasing by air one of its most important duties. But the fuller study of the air war at sea must be deferred to those times when it was to break out with terrific violence and when the shipping losses through air attack and the battle between aircraft and ships reached unimagined levels of fury. This note is merely to record the time of the beginning. Now turn to the broad inferences to be drawn from those curious, tentative early days of air struggle.

First, it is clear that neither side was certain of the power of air; but that Germany had—perhaps as much by good fortune as by logical reasoning—a more correct appreciation of the position than the Allies. The German army had retained its place in the German military scheme as the predominant instrument and consequently it had under its control appropriate air forces. This linkage was not appreciated by many observers in England. They assumed that the creation of a Luftwaffe indicated that the Germans had copied in detail the British organisation and had created an autonomous and largely independent air force. In fact it seems that the independence of the German air force was confined in the main to supply and that in all battle fronts air force units came under the Army commander in that district. Moreover it appears that every armoured division in the German army had its own air units permanently attached to it. They trained with it and lived with it and therefore were well placed to go into action with it.

Such points did not, however, emerge at first. And it must be said that Britain's preoccupations with peace had precluded that clear thinking on the application of air power in war which would have been necessary if all such factors were to have been rightly assessed by September 1939. The fact is that during the period of air war which has been outlined, the Allies were groping for aerial understanding. They had not previously assessed with any comprehensiveness the military aspect of aviation. A good indication of this was given by the Air Navigation (Emergency Restriction) Order

which came into force on the night of the 31st August-1st September 1939. It laid down many regulations affecting the use of civil aircraft, and it was followed by the Air Navigation (Restriction in Time of War) Order, 1939. The chief provision was that flights by civil aircraft over the United Kingdom or its territorial waters were forbidden except under the authority and in accordance with the terms and conditions of a permit in writing issued by the Secretary of State. Other regulations laid down that there should be no civil flying between sunset and sunrise; no flying at a greater height than 3,000 ft., or a less height than 1,000 ft. Control of civil flying by the military authorities was an obvious necessity of war; but the terms of these Orders showed that Britain had not planned for the full use of aviation for the prosecution of war. The concept was that civil aviation was one thing, and military aviation quite another thing, and that civil aviation stopped and military aviation started when war broke out. The concept of air carrying did not exist in Britain at this time. There was no scheme for the bringing in of civil aviation into the structure of military aviation. There was no scheme for developing immediately and rapidly the transport of troops and supplies by air. There was no sign of an acknowledgment of the wider meaning and the larger compulsions of aviation. There was no appreciation of the link between air transport and expanding communities.

Contrast with the limitations of the British view on the function of aviation in time of war with the continued development of United States civil aviation. Clearly the United States did not at this time undergo the revolution of thought and action which Britain—through her entry into the war—underwent. Nevertheless America's continued air progress and the manner in which American lines were reaching out greater and greater distances were a sign and a portent. Unfortunately the prophets and seers who were capable of reading these signs and portents in Britain were few and were not in positions of authority in the armed forces or in the Government. The outbreak of war did not affect the Pan-American Airways transatlantic service and, indeed, five hours after the declaration the American Clipper took off from Port Washington, New York, on its way to Southampton, carrying 25 passengers. After arriving in England the aircraft left again for the return flight according to schedule. Meanwhile, just before the outbreak of war, another Pan-American Airways flying boat arrived at Auckland, New Zealand, at the conclusion of a survey flight from San Francisco. It was the preliminary to the establishment of a regular fortnightly mail service across the Pacific, and it followed the historic flight

of Captain Edwin Musick with a crew of six in a Sikorsky flying boat in March 1937. Note well these United States activities, for the part played by American air power increased with the progress of the war.

At this time the air strategy of this world war had not been revealed to the people of Britain. Yet they were able three years later to look back on those early flights across the Atlantic and the Pacific oceans and to see how their destinies were influenced by them. As the battle of the Atlantic mounted in violence and ruthlessness so the airway over that great ocean became more and more a life-line for Britain; as the Japanese struck at Malay, Singapore, the Netherlands East Indies, and then Rangoon, and places in the Indian Ocean so the airway across the Pacific became a life-line for Australia and for the United States themselves. The pioneering aircraft of Pan-American Airways that flew to Auckland just before the war did the 8,000 miles by way of Honolulu, Caribou Island and Noumea in New Caledonia. These lines and the events of the opening stages of the war were portents; but, as has been said, there were few in Britain who read them aright and those few were not in positions to influence British war-time dispositions. We may express the central core of truth which was adumbrated by the aerial activities, military and civil, of the early period of the second world war, in the terms already used, namely that carrying strategy is basic world strategy; that carrying was in 1939 at one of the main transition points of history when a beginning was being made in transferring carrying responsibility from the sea to the air as it had earlier been transferred—with the expansion of communities—from land to sea. The war came at a transport transition period and, if the opinions here expressed are correct it was partly brought about by the compulsions which arose from this transport transition and from the scope for expansion which it laid open to the communities of the world. From county to country was the changed grouping brought about by the transition from foot and horse transport to wheeled transport; from country to commonwealth was the changed grouping brought about by the transition from wheeled transport to sea transport; and from commonwealth to a yet larger grouping was the change to be wrought when aviation brought its enormously greater potentialities for comprehensive high-speed transport into view. The communities expanded when they saw communications expand, or their desire to expand was partly created by the greater scope offered by expanding communications. Yet without this point expressed and in mind the belligerents did not at first exploit the full scope of air. Germany had a clearer conception of the possibilities than France or Britain;

but the United States of America had a clearer conception of the power and scope of the air than any other country. It was not until the United States had wound herself up to full war effort that the air came to be employed to the fullest extent. And these early days of war, which have been outlined, showed paucity of air ideas in Britain and France with a better comprehension in Germany.

Germany had seized on some of the possibilities of air carrying. She had grasped the tactical value of parachute troops and airborne troops in general, a value arising out of the selfsame causes as the value of commercial flying, causes which may be summed up in the two words: speed and scope; the ability to go anywhere and to go there quickly. Germany, with these things in mind, had created airborne divisions and she had evolved the system of collaboration between attack aircraft of the dive-bomber type and armoured vehicles. She had evolved the Blitzkrieg technique of concentration and collaboration. Britain had discussed and dreamed about independent air war; but had not appreciated that air war is rooted in land and sea war and that the period was one of transition. Britain, in fact, had been dreaming of a war of 1970 which might be an all-air war. But she had not prepared for either an all-air war or for a transition period war wherein land and air and sea and air must be inextricably linked in all operations. We have to admit that the military ideas of Britain in 1939 were not in harmony with the times. They were either completely obsolete, or else they were vaguely and dreamily futuristic. Their obsolescence was an unmitigated evil; but their futuristic tendency was of some good for it did mean that a sound system of aerial defence against aircraft had been evolved and practised under the leadership of Air Chief Marshal Sir Hugh Dowding, Air Officer Commanding-in-Chief the Fighter Command, later created Baron Dowding.

When we come to the air battles over Britain of the summer and autumn of 1940 this point will become clear. Britain had been backward in most aerial preparation. But in one respect she had been ahead of the times. She had accepted the doctrines of General Guillo Douhet and had dreamed about the total air war in which the entire grapple would be between opposing air fleets with armies and navies playing only secondary rôles. She had not made her preparations in accordance with these dreams; but had compromised and compromised and whittled down the Navy and the Army here and there and kept the Royal Air Force as small as possible. Yet she had this one merit that she had made some slight but sensible preparation

for meeting powerful aerial attack. She was without ideas or preparations for combined operations such as the Germans employed in Poland. She was inadequately equipped for the air war at sea and almost at once the Coastal Command of the Royal Air Force found itself much overworked in trying to aid the Royal Navy in such duties as the protection of convoys and the performance of anti-submarine patrols. But she had this one thing: a small but good fighter force with a sound and well-planned organisation for putting it in action and operating it.

We have finally to assemble the prevailing and somewhat contradictory views on the part that air was to play in war as they were held and expressed by laymen and staff officers in Great Britain:

- (1) There was a widespread belief that aerial bombing would be on a huge scale, would come immediately and might have tremendous effects.
- (2) There was a corresponding under-estimate of the value of air operations in support of land and sea operations.
- (3) There was a failure to appreciate the power of aviation in directions other than those of bombing and fighting, notably air carrying, including troop transport and the conveyance of parachutists.

In one direction, it will be seen, there was a tendency to magnify the power of the air (and this was fortunate for it gave Britain her powerful fighter defence system) and in other directions—notable in those concerned with co-operative functions—there was a tendency to minimise the power of the air or even to overlook it altogether.

Land forces were still being looked on in Great Britain as land forces; sea forces as sea forces. The three-dimensional theory of war had made small progress anywhere and almost no progress among the professional soldiers, sailors and airmen responsible for the structure of the British war machine. The concept of the "combined" operation and of the joint staff was only to come much later as a consequence of many tragic and dangerous lessons. Perhaps Germany had tied her air forces too closely to her ground forces—though this was not apparent during the first two and a half years of war in any campaign—but certainly Britain had neglected to solve the difficult and elusive problem of welding together her land, sea and air forces. She had neglected to study air and to understand air; yet she feared the power of air as taking from her her insularity. It was a paradoxical position, typical as an outcome of British thought. Talk there had been in plenty of the terrific

air raids that would shake London and of the raids that would be mounted against Berlin in return. But almost no talk had there been of the land-air links and of the sea-air links; of any such thing as tank and aircraft collaboration or the need for air cover for warships of all sorts and sizes. In short the reasoning had been incomplete or entirely absent. The Englishman had been guided by his general impressions and had not taken the trouble to work out the problem. It was not until its gravity was forced upon him that he turned to consider it and to try and solve it.

CHAPTER IV

IT has been said that in England the people looked towards the sky when war broke out and that although official preparations for war had been divided between those which over-estimated the independent power of the air and those which under-estimated the co-operative power of the air, the people at large had a widespread and prophetic instinct that air would dominate war. The early stages did not minister to this feeling. They seemed to show that air would play the same part as in 1914-18, though on a larger scale. They did not indicate that the whole strategy of war was altered; that the basic security of Britain had been affected; that the strategical structure of the defences of the British Commonwealth of Nations had been so much influenced by the coming of air power, that it was no longer a complete structure when built up solely on sea power. In looking to the second stage of the air war, the air war at sea, prospects were grim. The Englishman's faith in the Navy is unshaken at this time during the first two months of war. "The Navy's there." "Thank God we've got a Navy." In the common thoughts and expressions of the people; in the common beliefs and superstitions, there remained firmly implanted this faith in the British Navy. And the Navy itself, knowing and understanding its traditional responsibility to keep the island fortress safe whatever happened elsewhere, was a desperate and prodigiously efficient and capable fighting force.

Now we must look on the darker side; on the tragic diminution in British naval power through the development of air power. We have to face the worst condition of all for the English, the gradual wearing down of the power of a great race of seamen by the coming of a new mechanical power. The petrol engine and the aircraft were to eat into the bold, noble, undaunted characteristics of the Royal Navy itself. Yet it is a tragedy that could have been prevented and that might have been foreseen—indeed it was foreseen by some, but those officially in charge rejected their conclusions. They thought—as perhaps a majority, both in the British Isles and in the Dominions and Colonies thought—that the war of 1939 would be a war in which British airmen and soldiers would fight from stations in foreign lands while the British Navy would secure the safety against invasion of England itself. The power of the air bomber and the exploitation of the Douhet doctrine of heavy bombing of industrial centres was still looked on

as an independent activity. It was not connected in the public mind with invasion and with the marching of German soldiers through the towns and villages of England. In fact the popular view of air power partook of the official and Service view of air power to the extent that it was believed that it might strike tremendous blows at London and other centres of industry and population; but that it could not threaten invasion and occupation. It was thought that if the people could withstand the most intense and furious bombing, then the British Isles would hold. It was thought that if the British people could "take it" air could not conquer them. It was thought that the power of the air was the power of striking at people distant from the battle "line" as it was still thought of and not that it was part and parcel of three-dimensional war. The concept of three-dimensional war, in short, was not fully accepted. Air power was to be an adjunct to other kinds of power and it would make war more unpleasant and dangerous for the people in the British Isles, but provided they could hold out under the most frightful attacks, it would not threaten their fields and cities. It could not be the prelude to German soldiers marching in Trafalgar Square. This point must be seized with clearness. When Englishmen looked up in the sky in September 1939 they felt that great blows would be likely to fall upon them from there. But deeper in their hearts and minds there was the profound consciousness of the sea which surrounded them, of their "moat" which cut them off from the Continent and of the Royal Navy which stood guard and which would die rather than allow a single German to set foot on British soil. It was not for many months that the effects of air power on naval power were brought home to the people at large. It was not for many months that all heads of the Services saw that air strategy must be harmonised with sea strategy which was the earlier foundation of Imperial strategy. This is a further translation into military terms of the influence of aviation on expanding communities. That air transport offered opportunities for expansion to all countries, implied that it offered opportunities for better cohesion to a far-flung Empire like the British. How easy it is to see such a point afterwards; how difficult to see it in advance. That Imperial strategy was based on sea power was known and taught at the Imperial Defence College. But that air strategy must be harmonised with sea strategy to become a part of it and a part of central Imperial strategy was not taught. Nor did the wider public understand it or the Air Staff appreciate it.

For them the picture of the war of 1939 as they foresaw it was clear. It was a refurbished picture of the war of 1914-18. The Royal Air Force

would have its squadrons in France, fighting alongside the French *Armée de l'Air*. The Royal Navy would protect these islands against invasion and would exercise pressure on the enemy by blockade. (No suspicion existed that air carrying might break or diminish the pressure of a blockade by sea; no thought that it might make the invasion of islands possible without full command of the seas surrounding them. The augury of Crete was still in the womb of time.) Every excuse existed for this wrong interpretation. In September and October 1939 the war of 1939 echoed in identical tones the war of 1914-18. Those with senses attuned to the whirling fortunes of war and to the surprises of history ought to have felt a sinister heaviness in the air. They ought to have felt in their bones that fearful revelations were on the way. They ought to have known that no war repeats in precise terms the war that went before it. They ought to have felt that behind the façade of September and October 1939 something tremendous was happening and that when its effects were made plain they would change the whole face of the fighting fronts.

We have here to draw one of the least noticed but most tragic periods in British military history. We have here to depict briefly a period during which comfortable thoughts predominated and aged, maritime Britain believed that she still retained the powers of youth. How often does an old man return to the hobbies of youth imagining that he can repeat the great performances of earlier years! Yet he is never able to do so. Age cannot be evaded. The major involution must be accepted and allowed for. Yet in 1939 Britain thought to repeat the triumphs of her youth. She saw herself again as a supreme maritime power, ruling the roost; exercising power through naval blockade; sending out expeditionary forces from her island home, but preserving that island home secure from the invader by the exercise of sea power. It is extraordinary, when one looks back, to notice that the independent use of air power though much discussed and though generally expected, and to some extent prepared for, was looked on as the exercise purely of destructive force at long range. The people of Britain braced themselves to face great bombing raids, determined not to give in to them. But they saw them only as independent destructive actions, never as part of a larger strategy.

Air carrying was not seen in its larger aspect as a world influence, encouraging communities to expand and providing them with the powers of expanding. It was not seen as linked up with sea power and as an extension of it, but as a thing on its own, able to destroy, but not able to build; able to

bombard, but not to occupy or to provide for occupation. In the previous chapter some of the early air operations are mentioned. They reveal in part the attitude of the Service chiefs, of the politicians and of the public towards air power. But now, drawing on a larger canvas, we shall notice the other part of that attitude and the greater part. Look at France in the latter months of 1939. Look too at the direction of the German air effort during the same period. We shall see in France a reprint of the picture of France in 1918; and in Britain we shall see a reprint of the picture of Britain in 1918. Neither side gave clear indication that it had seen and accepted the development of war; neither side gave clear indication that it had developed and was putting to use a new theory of war. Germany's only indication had been given not in France or in Britain, but in Poland. And as has been pointed out Poland was so far away and the circumstances there so little known, that the implications of what happened there were not seen and the British view of what the war would be like remained unaltered; unaffected by any belief in the wide scope of air or in its effects on sea power. The two watertight compartments therefore remained; with an expeditionary force working from bases outside the British Isles and with the British Isles themselves protected by the Royal Navy and linked with the Dominions and Colonies by the exercise of sea power on the traditional and well-tried model.

In France in 1939 the Royal Air Force was divided into two parts, the Advanced Air Striking Force and the Air Component. The Advanced Air Striking Force consisted mainly of medium bombers, Fairey Battles and Bristol Blenheims, while the Air Component was in itself intended to be a small balanced air force designed to work with the British Expeditionary Force. The Advanced Air Striking Force had its aerodromes prepared for it by the French and on the eve of war it flew over to France and its aircraft were bombed up in readiness for the orders that were never to come. It went over in high spirits and with great aspirations. It was manned by well-trained men and supported by well thought out equipment. Its aircraft even then were not looked upon as being of an exceptionally advanced design so far as the Battles and Blenheims were concerned; but it was believed that the Blenheims at any rate would prove as good as anything comparable possessed by the enemy. Both the Advanced Air Striking Force and the Air Component were high in morale and they did without question represent some of the fine qualities of the British race. The fighter units were equipped with Hawker Hurricanes, for no Spitfires were sent to France. They were held back in England in Fighter Command ready to meet the

independent aerial attacks that were expected there. But the Hurricanes were known to be of good quality; were liked by the pilots and were comparatively easy to service and maintain in the field. The Royal Air Force aerodromes were organised in accordance with protective theory. All aircraft were dispersed around the landing area, preferably in natural surroundings, such as woods so that they were concealed from enemy reconnaissance aeroplanes, and, where there was no natural cover, with camouflage netting over them. Royal Air Force personnel were billeted in the French villages—the selfsame villages which had known the Royal Flying Corps in 1914-18. On the aerodromes themselves there were mobile offices in the form of motor-drawn trailers constructed for this purpose. Messing was in the villages and was provided in part by the local facilities, the cafés and restaurants, and in part by special apparatus such as mobile kitchens. High spirits informed the early period of service in France for the entire Royal Air Force personnel. They, like their fathers in 1914-18, appreciated and enjoyed the unaccustomed freedom provided by French ways of life. They enjoyed the cafés and the women. They enjoyed the wine and the rich fields of France. They saw here and there the relics and reminders of the war of 1914-18, and they determined that they would prove worthy descendants of those who fought for France and Britain over the same country before them. Royal Air Force headquarters was in Rheims and there at the *Lion d'Or* officers congregated and talked and drank champagne and enjoyed themselves just as their forebears had done a quarter of a century before. Being "in France" gave a special "active service" label to the officer or airmen and it was not until much later that it was recognised that active service in its realities had yet to come; that it would suddenly be shaped differently from the last war and that the lovely, happy life in France would suddenly be turned to dust and flame and smoke and the trampling of the enemy hordes. But those last months of 1939, as winter came, were echoing, as if in final reminder of the glories that had gone—glories shared by France and Britain—the events of 1914-18. The pleasure-seeking in Rheims; the friendships with French girls; the wine drinking; the luxurious eating; the pleasing sights of French civilisation and the homely pleasures of French agricultural villages—all these were known by the comparatively few Royal Air Force officers and airmen who went out with the Advanced Air Striking Force and with the Air Component.

Nothing happened at first to weaken their own concept of their duties and of how they would perform them. Although the order to bomb, which the

Battle squadrons had awaited on the night before the declaration of war, did not come until later, the two opposing armies—the French and the German—lined up just as they had done twenty-five years before. And the air activities seemed to be repeating those of the earlier war. There were occasional reconnaissance sorties by both sides; with occasional fights. Our pilots looked down on a scene which—apart from the absence of shell devastated ground—was the same as that of 1914-18. Sometimes German reconnaissance aircraft came over and took photographs. Sometimes our aircraft went over to Germany and took photographs. Only a few small incidents here and there sounded the warning that *things were different now*. An air combat between a Hawker Hurricane and a Dornier 17 took place—according to the Hurricane pilot—at about 27,000 ft. That was higher than any air fight had ever taken place before. The Hurricane pilot attacked with his eight guns and the Dornier fell and dived into the main street of a French village. The local inhabitants looked and went on with their ploughing or else examined the gruesome pieces of the German crew which were scattered about the local churchyard and on branches of the surrounding trees. It was just like 1914-18. And when Royal Air Force officers arrived to inspect the wreckage the local inhabitants expressed their appreciation of their victory, feeling that they were well defended by these men, descendants of the men who defended them so well in 1914-18. It was all repetition. The French squadrons and the British visited one another and there were uproarious guest nights. English learned French; French learned English. Like some fantastic remembered dream it was all coming back; all being enacted over again, but this time—to the keener sensibilities—with a strange shadowy quality about it. There was solidarity between France and Britain, solidarity against the common foe and every good Englishman and every good Frenchman sought by every means in his power to increase it. A first warning that things were to change came with the reports from French reconnaissance aircraft that the Germans had, by the 23rd of September 1939, transferred their air force units from Poland to behind the Siegfried Line.

But the Royal Air Force continued dropping its leaflets. On the 1st of October five Royal Air Force reconnaissance aircraft met fifteen Messerschmitt fighters over the Siegfried Line. Two German machines were destroyed while the R.A.F. lost three. Then, on the 2nd of October, as if further to build up the impression that a piece of history was being repeated and continued, came the Air Ministry announcement that for the first time

Royal Air Force aeroplanes had flown over Berlin. Leaflets were dropped, this being the eighth leaflet raid. Then came the visit of Air Chief Marshal Sir Cyril Newall to France. Air Chief Marshal Newall, highly intelligent, keen and competent, was Chief of the Air Staff. Before the war he was unknown to the British public. Now his name began to receive publicity. He approved of the dispositions in France and affirmed the solidarity between the British and French forces. On the 9th October the whole of the German front from France to the North Sea was reconnoitred in daylight by four Royal Air Force aeroplanes. They departed from aerodromes in France and landed at aerodromes in England. Now there began the prelude of over-confidence which so often in war pressages trouble. The Allies were well prepared and would exploit the means of 1918. The French authorities confirmed the view that the German aircraft were less manoeuvrable than the French and that the French Curtiss P-36 (forerunner of the subsequently famed Tomahawk, Kittyhawk, and Warhawk) could out-fight the German fighters. Sir Kingsley Wood, who was Secretary of State for Air at this time, reviewing the work of the Royal Air Force in Parliament was able to give a favourable account of its activities and especially of the success which was attending the work of the Coastal Command. All was well. That was the attitude. That was generally speaking the national feeling. All was well. The Royal Air Force was much better than the German air force as had been expected. The French air force was working well with it and proved also to be better than the German air force. All was well. Only a few wondered if we had yet seen the real beginning of air war as it would be waged this time.

Then, on Monday the 16th October came a reminder that more might be behind the activities than had so far been recorded; a reminder that Britain's security still rested on the sea. On this day the first enemy raid was made in which the aircraft reached their objective in Britain. And it was directed with significant clearness at British sea power. It was the raid on the Firth of Forth and the attacking force consisted of about twelve aeroplanes, mostly Dornier 17s. The attack was at 2.30 and the cruiser *Southampton* was hit as well as the destroyer *Mohawk*. Four of the enemy bombers were brought down. On the next day Scapa Flow was raided and the *Iron Duke* was damaged. October ended with this shadowy, indistinct pointer to the future. German raiding had been directed at the British fleet. Germany was beginning to intimate that she had a plan for coping with British sea power by setting air power against it. Germany had concentrated her

bombing on sea bases. But these things led to no drastic modification in the general idea of how the war would be waged. There was still the old pattern holding up, although it was shaken a little by the attacks by German aircraft on naval bases so far from Germany. But the pattern remained. The Royal Air Force in France, working with the British Expeditionary Force and with the French, and the Royal Navy guarding England against everything save the independent, "damage" raid of the Douhet type and exerting pressure on the enemy by blockade. Nothing as yet had occurred which was harsh enough or pointed enough to show that we were starting on a new kind of war; a war having its deepest origins in the compulsion to expand of the communities, ministered to by the carrying power of the air, and to be waged largely by air. This period has still that fantastic appearance of a dream. Rheims; the *Lion d'Or*; the champagne; the French girls; the fertile fields of France; the beautiful language; the welcome of the people; the fighting as a continuation of the fighting of 1914-18 with its horrors and heroisms—but nothing new. All was the same; all the same as before. There might be independent air raids; but otherwise all would be the same. Even independent raids were not new.

Only those hints came in the Firth of Forth and at Scapa Flow, that sea power, the real basis of British security, the real link between the parts of the British Commonwealth of Nations; the real foundation of Imperial strategy, had been strangely modified. And the hints were not taken very seriously. The British public had heard the views of the extremists before the war and when the sirens sounded on the 3rd of September 1939 they believed the experts, went down to the cellars and awaited what they fully expected would be the most tremendous air raid in history. This was to be the "independent" air war. They recollected that the whole matter of the independent long-range bombing raid had been thrashed out during the war of 1914-18. They recalled the dictum of Marshal Foch that "No more than the Artillery, the Armoured cars, etc., can the Air Service by itself constitute an Army" and they believed then that the Germans might attempt to inflict fearful destruction by air; but that they could not achieve victory by that means while the Navy stood firm. They believed their own Field Marshal Earl Haig who, in his memorandum to the Chief of the Imperial Staff, dated 15th September 1917, said on air bombing: "I am unable to agree that there is practically no limit to such methods in this war, or that—at any rate in the near future—they are likely to become the principal operations of war, to which older forms of military and naval operations may

become secondary and subordinate" and they thought of air as an independent process, complete in itself, which the Germans would use against us, but which would not markedly affect land and sea war. But when the weeks went by and nothing happened as they had expected, and when no tremendous air raids were launched, they swung to the opposite view. Their belief in armies and navies returned and they thought of them as behaving exactly as they did in 1914-18, but with the air aiding them on a rather larger scale. The permeation of all war by air power was not guessed. It was not seen that the war had not worked up to full fury. So the early German raids on British naval vessels in the Firth of Forth and elsewhere, although they were in reality signposts of subsequent enemy intentions, were not taken as such by the public or indeed by many of the high-ranking officers who constituted the staffs of the three services and whose views were brought together at the level of the Chiefs of Staff Committee. Nothing that happened in November served to alter the views that were generally held on this subject. The British Expeditionary Force had its Air Component safely in France, ready to aid it just as the Royal Flying Corps aided the Army in 1914-18, and there was the Advanced Air Striking Force to carry on the strategical bombing which was recommended in 1914-18, and started by the Independent Inter-Allied Air Force under Marshal of the Royal Air Force Viscount Trenchard. How close was the similarity between the activities of the Imperial air forces and allied air forces at the outbreak of the war in 1939 to the activities of the latter stages of the war of 1914-18 is shown by further reference to some of the communications on air policy which passed at that time between the chiefs of the services.

First of all, in that 1914-18 war, the purpose and scope of strategical bombing was neatly circumscribed in the heads of the agreement as to the "Constitution of the Inter-Allied Independent Air Force" between the British and French Governments as transmitted through the Supreme War Council to the American and Italian Governments for approval. This document stated that the object of the force was "To carry war into Germany by attacking her industry, commerce, and population." It went on to say that "The complete realization of this scheme is not to be undertaken until the imperative requirements of the fighting have been satisfied or during the intervals of the fighting. It will therefore, be possible to carry out this plan in two ways according to circumstances. (a) *During periods of active operations.* The requirements of battle will have to be met first, thus reducing in varying proportions the strength of forces available for raids on the interior

of Germany. The bombing action being begun will, however, have to be pursued even with a reduced strength. (b) *During steady or quiet periods.* Bombing raids on the interior of Germany become the chief work of our bombing squadrons. Having satisfied the Air Service requirements of the Army, all available long-range aeroplanes will be free to take part in the raids."

In a further section dealing with the establishment of the inter-allied independent air force it is said that "This establishment will include Allied Flights of heavy weight-carrying aeroplanes with a wide radius of action, and will probably be reinforced later by further available Allied Flights of the same type. The Force will be placed under the command of General Trenchard as Commander-in-Chief, assisted by a staff including besides the present staff, an officer of each of the Nations represented in the Bombing Force. General Trenchard will be under the Supreme Command of Marshal Foch for operations." The date is 2nd October 1918.

It will be seen that a remarkable parallel exists between these arrangements and the dispositions of the air forces in France as already outlined at the outbreak of the second world war in 1939. Only one significant change in attitude is to be observed and that concerns the last paragraph of the document cited. In 1914-18 the strategical bombing was to come under the supreme command of Marshal Foch. It was not to be "independent" in the more rigid sense later canvassed. In this respect the arrangements of 1914-18 were really more advanced than those of 1939. For in 1939 it was only the Advanced Air Striking Force and the Air Component that could be said to come under the Generalissimo while in the United Kingdom a considerable force of fighting and bombing aircraft remained outside his direct control.

It was not only the 1914-18 agreement quoted that emphasised that the strategical bombing force should come under the Commander-in-Chief in any theatre; for the point is made in numerous other documents and appears in the Joint Note, No. 35 of the 3rd of August 1918, which was addressed to the Supreme War Council by the military representatives of the French, British, Italian, and American sections. This says amongst other things that "should an Inter-Allied Bombing Air Force be created in any other theatre of operations, this force should likewise be exclusively subject to the authority of the General Commanding-in-Chief the Armies operating in that theatre." Yet it was not until July 1942 that the conception of the employment of bombing forces had returned to this

position, for in that month the Prime Minister, Mr. Winston Churchill, disclosed during a debate in the House of Commons on the retreat of the British forces in Libya and Egypt, that General Auchinleck, the General Officer Commanding-in-Chief in the Middle East at that time, had been authorised to dictate to the Air Officer Commanding-in-Chief in the Middle East—at this time Air Chief Marshal Tedder—the targets and tasks upon which the Imperial and allied air forces in that theatre were to concentrate their attention. In the subsequent operations in Sicily and Italy the air forces in the theatre came under General Eisenhower. Here is a most curious point of military history. There had been in 1918 a realisation that “independent” bombing must never be really independent but must be influenced by and adapted to the fighting in the various theatres and that the forces employed must come under the Commander-in-Chief of the Armies; yet British doctrine had departed entirely from that view and had then come full circle back to it by 1942. Only the Advanced Air Striking Force, which consisted of 180 aircraft (179 of which arrived in France) was under the higher military direction. Held back was the main force (small though it then was) of heavy bombers. So when from the 10th of May to the 16th of May the Advanced Air Striking Force was called on to perform the expected bombing raids from its bases around Rheims the first principle of concentration of force was to some extent being neglected and the second principle of unity of command was also being neglected. Looking back we can see clearly the errors of that time. But at the moment they were difficult to distinguish for many reasons, among them—curiously enough—the widespread desire to conduct war according to the most progressive ideas. For it is one of the paradoxes of the time that those who advocated the full employment of aviation most strongly were most inclined to neglect the integration of air power with land power and with sea power. These early stages of the war of 1939 were shaped by British strategy on the lines of 1914-18. There was to be the Expeditionary Force, working with the French Army and having its own air units. There was to be an Advanced Air Striking Force for doing strategical bombing dictated directly or mainly by the Army commanders and then there was to be the home-based bomber force of heavy machines which would act independently of the others though in conformity with the higher strategy laid down by the War Cabinet. As for the power of the air over the sea, it was not considered to extend beyond the provision of assistance to the Royal Navy in overcoming the menace of the U-boats.

What a strange picture of entangled strategy is here revealed! The air enthusiasts loudly stated that air power could do everything. The Expeditionary Force appeared satisfied with its small Air Component. Bombing was strangely split up into various forms. U-boat defence was to be aided by air power, but otherwise the traditional basis of Imperial strategy, the sea ways, were not considered to come into the air picture at all. It is difficult to see how military thinking could have so far divorced itself from the basic principles of strategy as affirmed by the principal writers on the subject and as affirmed in every war in history. Yet the introduction of the new weapon-carrier—the aircraft—was the cause of this failure of military thinking. It confused the issue and made many things obscure that had formerly been plain. It took the minds of those who considered these matters off the main objects of military activities. And the voices of the extremists merely added confusion by proclaiming that navies and armies were out of date and that air forces would in the future do everything. This extremist view was based on the methods of control without occupation that the Royal Air Force had employed with success to quell the risings of refractory tribes in various parts of the Empire and on the achievements of aircraft especially in the police work on the North-West Frontier. Here and there were a few who saw more clearly. On the military side they were rare; but it must be stated to the honour of the Royal Navy that some of its senior officers saw clearly and stated repeatedly that the aircraft was a weapon-carrier like the ship, and that its ability to fly equally over land or sea demanded that it should be worked into Imperial strategy within the framework of sea strategy. Admiral Sir Herbert Richmond in particular, though his comments were much criticised, was clearer than most as to the part that ought to be assigned to aircraft. He looked back as well as forward and sought to harmonise the basic Imperial strategy with sea and air power.

Nothing that happened in the early days of the war, however, revealed clearly what errors had been made. Nothing showed that the part assigned to air power in collaboration with land and sea power had been incorrectly appreciated. Nothing emphasised that strategical bombing ought to be part of a "methodical plan," or that every strategical raid should play its proper part in the three-dimensional strategy of the newer warfare. There was the Royal Air Force, divided up into packets; the fighter, bomber and coastal forces in the United Kingdom, the Air Component with the British Expeditionary Force in France, and the Advanced Air Striking Force in France. It was 1918 over again with the difference that the air

had been removed rather farther from the land and the sea than it was then and that there was less unity of command over the air forces available. Only in one thing were the British air forces of 1939 able to say that they were up-to-date and militarily efficient, and that was in the devotion to duty of all ranks and in the high morale of all ranks. The Air Staff, entangled by the mass of theoretical argument, confused by the sweeping claims of the extremists, seeking to meet the demands of both the Army and the Navy without in any way weakening their own hold over the Royal Air Force, overweighted by the problems that confronted them, muddled by the numerous boldly supported, yet unproved, ideas that came before them, were yet saved by their unswerving honesty of purpose. They had no thought but to do the best for their Service and the country. Air Chief Marshal Newall, a fine-textured personality, thought hard and worked hard with only the best for his Service and for his country in view. That was his sole consideration and his devotion saved him from the appalling disasters which might have supervened as early as this through the poor quality of British military thought and the absence of a logically planned integration of land, sea and air forces for the application of their maximum power both in defence and in attack. No high authority with the power to put ideas into practice noticed the gap that was opening between air and sea strategy. Those who looked to the sea for the safety of Britain and for the help of her Allies were scorned as living in the past and looking back to past glories. Every mind turned to the air as if it alone could replace and overmaster land and sea power. Blockade was still looked on as a purely naval affair. The operations in France were still looked on as an army affair supplied by the navy and with slight air support. It would take volumes to try and unravel the conflicting and knotted opinions and theories of that time. But this much emerges; that the Royal Air Force set out to repeat in 1939 the duties which the Royal Flying Corps and the Royal Naval Air Service, together with the Inter-Allied Independent Bombing Force had performed in 1918.

But while these preparations for repeating past triumphs were in train, the enemy was completing his novelties and his ingenious military combinations. He was in no uncertainty about the part he was to make the air play when he struck at France. He was in no uncertainty about the part he would make it play to blast a way for his divisions and to support his U-boats. The pattern of the blitzkrieg had been meticulously drawn out and all was ready with a new thing and a harder and sharper thing that had

been contemplated in 1918. The tank and the aircraft were to be used in a strong collaboration. Land and air forces were to be integrated and to acquire from that integration a special virtue. The German air force had been built up by those with air-fighting experience of 1914-18, but they were untrammelled by traditional soldiers' views. Some were military upstarts and this gave them the advantage that they had to work out on their own the part that air was to play and to rely on no established and traditional system. Germany had a logical plan for the employment of integrated air forces. She had peered some way (though as I shall hope to show much later in this work not by any means all the way) along the path of air power and had noticed how air power should be integrated with land and sea power to minister to three-dimensional strategy and to overcome those who stuck to the two-dimensional strategy of land, like France, or the two-dimensional strategy of sea, like Britain. Germany, to put it briefly, was to oppose three-dimensional strategy and three-dimensional tactics (in the pattern of the blitzkrieg) to the Allied two-dimensional strategy. For although the Allies had provided air power to assist land power and sea power, they had not visualised it as integrated with land and sea power and as playing a greater part then either.

Now a hush falls on the world. The armies are drawn up in France on the copybook pattern, facing one another in two long lines. Behind them the industries of the belligerents produce shells in quantity for battles that were to repeat the battles of 1914-18, but on an even vaster scale. The Germans whipped up their propaganda. They had, they said, a "secret weapon" against which there was no defence, a weapon which could be used against Britain, but which Britain could not use back. Many men, armed and trained, waited the mighty clash which they were certain was to come. At this time it was my duty to visit France and to call on some of the Royal Air Force aerodromes there. Everywhere I felt the air of expectancy. Everywhere I noticed the weight of great events pressing down on the thoughts of the people. And, whether my impression was true or not, I also noticed that curious dream-like atmosphere. In the welcome given to English people by the French there was a curious ghost-like quality. Most people on visiting a new place, have had the strange impression that they have seen it before, and that they are re-enacting a scene from some distant past. The whole thing is mystical and ghost-like. And now in France there was that same impression. It had all happened before, long ago. We were all figures automatically repeating certain actions determined for

us by some huge, geared mechanism which had now run full circle. The great armies were lined up, the air forces were ready. It was all the same. There was visible no sign of change from 1914-18. Only here and there and now and then was there that prophetic instinct; that irrational feeling that it would not be the same. In the Royal Air Force squadrons I was gripped and puzzled. I visited the aerodromes and the messes. It was a reflection in a mirror of my own personal experiences of 1914-18 when I was stationed on aerodromes in France with the Royal Flying Corps. The veils of the succeeding years were drawn momentarily aside and there, before me, were the same aerodromes, the same messes and even the identical characters that used to be my comrades in arms, reincarnated and going through the same motions like mechanical figures.

At such moments a solemn appreciation of those young men who formed the Royal Air Force overwhelmed me. Their cheerful daring was the saving grace for Britain. They would not fail. They would work and fight to repair the false doctrine, the divided forces, the lack of a central objective and all the other faults that afflicted the higher command. I do not here seek to apportion blame. But it is clear that the quality of the officers and airmen and of their equipment was, at this moment far superior to the quality of thought and planning to which they had to conform in their actions. So now the hush grows quieter. In Britain life goes on almost normally. The old men in political power are insensitive to the oppressive heaviness in the air. They see all correctly set for an easily won war; for a repetition with slight variations here and there of the war of 1914-18. They boast. They preen themselves on their preparedness. They promote themselves for their services to the nation. While in France the officers and men of the Royal Air Force wait, and among those attuned to the times, the feeling grows that great events are pending and that great surprises are to occur.

Nineteen thirty-nine came to a close with the enemy intensifying his aerial effort against British shipping. Enemy aircraft flew over the Orkneys and over Scotland. While the forces in France waited; air fights of gradually increasing magnitude took place over the seas encircling Britain. On the 23rd of November it was stated that German aircraft were laying magnetic mines. There was speculation as to whether these were the "secret weapon" mentioned by the German propaganda services. Whether they were that or no they did represent a piece of advanced thinking in the use of air at sea and they therefore drew attention again to the power of the air to build

up the power of the sea when correctly integrated with it. On the 28th November a dusk attack on the enemy seaplane base at Borkum was made by a squadron of twelve Bristol Blenheim fighters. Then, on the 3rd December, German warships were attacked near Heligoland, by about twenty Vickers-Armstrongs Wellingtons. In the same month the Air Ministry made its first announcement about the Royal Air Force "security patrols" to check the activities of the German mine-laying aircraft. Sir Kingsley Wood, who proved to be one of the best Secretaries of State for Air because he freed industry so that it might achieve output, and encouraged advanced thought in the Royal Air Force itself, said that the second chapter of the air war had begun with the enemy raid on the Firth of Forth on the 16th October. He spoke more truly than he could have guessed at the time for, as has here been indicated, this raid really marked the recognition by the Germans of the part that the air could play in the war at sea and was a warning of the effects of air power upon the traditional exercise of British sea power. British policy remained as at the early stages of the war and confined bombing to German ships, though it had been indicated that if the Germans bombed land targets the Royal Air Force might retaliate. In late December this policy of refraining from attacking land targets began to be questioned. But it was really part of the complacency of the Government and the belief that we were seeing a repetition of the events of 1914-18. It was thought that there would be no need to stir up bombing activities in order to win the war. It was during December that German reconnaissance aircraft appeared to British fighter pilots to be more difficult to shoot down than before, and the reason was attributed to the use of self-sealing fuel tanks. It has to be recalled that at this time Russia was fighting Finland. She was using aircraft to raid Finnish towns, but not, so far as was known in England, with any remarkable success and certainly not with sufficient success to affect the official ideas upon air bombing which then prevailed. At the close of the year the position remained. Only the sense of impending events was heavier and more pervasive. On the 30th December, General Vuillemin, head of the *Armée de l'Air*, in a New Year greeting to the Royal Air Force paid a tribute to British air supremacy on the Western Front. But General Field Marshal Göring made the statement that "The eagle (representing the German air force) will swoop and strike when the Führer gives the order." Nobody took much notice of such talk because the Germans were indulging in a great deal of it and little of what they said had any reference to actuality. Here and there warnings of the wrath to come

were uttered. The Berlin correspondent of the *New York Herald Tribune* wrote in January that the German offensive was being prepared for 1940, and that it would rely heavily upon air attacks. But still events were concerned only with the war at sea. The Orkneys and the Shetlands were the places where the main enemy air activity was concentrated. Lord Lothian, the able British Ambassador in Washington, who had done better than almost any other Englishman in securing American confidence in and even American affection for Britain, spoke in Chicago and said that the Germans would probably throw all their forces into a "terrific attack by land, sea and air in the early spring." On the 9th January among the ships attacked by German aircraft off the East Coast of Scotland was a Trinity House boat which was relieving a lightship and five fishing smacks, but there were no other signs of the coming storm.

The first months of 1940 passed with the feelings that have been sketched remaining predominant. There were those who were satisfied that the new war would be like the old; that our preparations were correct and would be effective and there were those who felt more and more keenly an uncomfortable foreboding. They wondered whether the rapid collapse of Poland had indeed been because the Poles were ill prepared for war or whether the Germans had employed a new tactical technique; they wondered whether the blitzkrieg incorporated a scheme of waging war against which the "lines" of 1914-18, however devotedly defended, would be an inadequate protection. Air Marshal A. S. Barratt had been appointed Commander-in-Chief the British Air Forces in France, and increases to the forces at his disposal were reported in January 1940. On the 25th of January the German News Agency stated that if bombs were dropped on Berlin, ten times the number would be dropped on London. According to a statement in the House of Commons an Air Ministry estimate had been made which gave the probable casualties in an air raid on Britain as 200,000. This was a period of rumour and counter-rumour. On the 29th of January the air attacks on British shipping reached a new point of intensity. On the 3rd of February the first German aircraft to be brought down on English soil fell near a Yorkshire farmhouse. It was a Heinkel; one of the crew was dead and three were wounded. On the 5th of February there was the fifth meeting of the Supreme War Council in Paris and Sir Kingsley Wood attended in his capacity of Secretary of State for Air. On this day also a much smaller event occurred which yet had its significance; it was a report on the use by the Russians against the Finns of the Molotov "breadbasket," a multiple

incendiary bomb, at first scorned by British technical experts, but later seen to be of value, and imitated by the Germans. This was an indication of the smug satisfaction felt in the technical progress in weapons made by the Allies. They were not at this time greatly impressed by magnetic mines, "breadbaskets" or any other novel devices employed by any of the belligerents. Mr. Neville Chamberlain in the House of Commons on the 15th of February asserted that "Whatever be the length to which others might go, the Government will never resort to blackguardly attacks on women, children and other civilians for the purpose of mere terrorism," a statement which revealed not only the humanity of Mr. Chamberlain, but also his feeling that world war number two was to repeat in essence the pattern of world war number one, and that the belligerents could control and guide events. Less than three months are now to go before the great awakening. And an incident occurred which demonstrated that the spirit of the British fighting man was as high as ever; it was the incident of the *Altmark*. Aeroplanes of Coastal Command of the Royal Air Force located this German prison ship with British prisoners on board and H.M.S. *Cossack* intercepted her, put a boarding party aboard and released the British prisoners. Now we hurry forward to the great moment. February glides by; March comes and goes and still enemy air activity is directed at shipping and is mainly spread along the east coast of Britain. Air-raid warnings are dotted here and there; but no strong raids are made on land targets. General Field Marshal Göring, however, showed Mr. Sumner Welles, President Roosevelt's envoy in Berlin, enlargements of photographs covering the whole of the British Isles and Göring threatened that big bombing attacks would be made. It would be beyond reason to attribute to the enemy a greater cunning and more abstruse propaganda method than is likely. But it must be noted that the concentration of the enemy bombing on small-scale attacks on shipping, the absence of large-scale attacks on land targets and the threats of huge attacks to come, did assist in confusing British thought on the subject of the part the air was to play in the war. It suggested on the one hand that the air would be in exactly the same position as in 1914-18, and on the other it suggested that it would be used independently to flatten out British cities and British resistance by "Douhet" attack. Then on the 17th of March German aircraft bombed land targets near Scapa Flow and killed a civilian in the Bridge of Waith village. On the 19th the Air Ministry announced the biggest air raid of the war to this time. The Royal Air Force bombed the German base at Hornum, Sylt, for seven hours using Handley Page

Hampdens, Vickers-Armstrongs Wellingtons and Armstrong Whitworth Whitleys. It was a beginning to the bombing war, although a further interval was to elapse before it was to be followed up, and in the meantime shipping remained the main target for the enemy and British pilots were mainly concerned with the dropping of leaflets.

Now the period of acceleration to the fateful month of May. On the 3rd of April No. 10 Downing Street announced that Sir Samuel Hoare succeeded Sir Kingsley Wood as Air Minister. On the 6th of April Professor Koht, Norwegian Foreign Minister, warned the belligerents against violating Norwegian neutrality and on the 9th of April the German High Command issued a *communiqué* stating that Denmark had been invaded at six points while Norway received an ultimatum at 5 a.m. and German bombers were over Oslo at 7.45 a.m. By that evening the German High Command announced that all bases of military importance in Norway were in German hands. It was breathtakingly swift, this enemy move. It showed at once how much he relied upon speed. Britain was still collecting her thoughts, still wondering and giving herself over to indignation while Germany was capturing and consolidating.

Again we must look at events with a calculating eye, realising that we see them now clearly, whereas then they were obscure and confused. But it has to be said that the use of air power in these early stages by Britain was imperfectly adapted to the strategical situation. The fault did not lie only with the smallness of the force. The Royal Air Force sought to make Stavanger unusable by bombing it. The place was raided again and again by various aircraft. But meanwhile the Germans were swiftly moving about Norway by air and were putting into use other aerodromes. They were all the time working their air with their land forces, not spreading their air power out tenuously on missions far from their bases. That was what the Royal Air Force was doing. It might be said in extenuation that it was forced to do it. But that again implies an imperfect appreciation of the situation. Norway was a warning, but it did nothing to lift the foreboding that held the people. It did nothing to alter the long-held views about France and about the pattern of the war with the two great opposing armies and the assisting air components. April passes to the playing out of a struggle between Germany and the allies in Norway. It was a struggle by no means clear in its implications. There was the historic and heroic attempt to establish a fighter base in Norway, on a frozen lake, with Gloster Gladiators. There were great feats of arms by British pilots

and air-crew members. There were many examples of the highest courage and the greatest devotion to duty. The new generation was proving itself and showing that it was made of the best human materials. But the plan, the tactical scheme, the strategical background; these remained as obscure, muddled and uncertain as ever. They seemed not to have advanced with the times. They seemed to be less competently managed than in 1914-18. On the 4th of May, however, there came the general agreement between commentators on the war that the enemy had secured air superiority in Norway, and that this had prevented the British expedition there from succeeding.

Now a few more forebodings. The Italian newspapers said that England was at the mercy of the German air force based in Norway. *Svenska Dagbladet* predicted total air war based on the Norwegian west coast. A few reports came in about the use by the Germans of parachutists. All these were straws, showing which way the wind was blowing.

But in France the great armies were lined up; the supporting air units were at their stations. And if it should chance that air power was proved stronger than had been supposed; why there, in England, were the fighter and bomber forces that could wage air war all on their own and without reference to the land or the sea. All was set; all prepared. The Army would fight beside the heroic French and hold the might of Germany. The Royal Navy would exercise the pressure of blockade and keep England secure against invasion. Sea-girt, Britain was still sea-protected. Britain could be a base for independent air power; but it could not be an objective of any form of three-dimensional war. So even the stroke in Norway did not awaken a full realisation of the threat that stood; it did not offer a fuller revelation of blitzkrieg; it did not show more clearly the part that aviation was to play in the newer warfare; it did not make clear that Imperial strategy was now a half-strategy because it had not taken into full account the power of air plus sea plus land. Many were complacent. Most were hopeful. All were confident. It would be the same again. The Royal Navy; the "sure shield"; the British Expeditionary Force alongside the vast, efficient and brilliantly generalised French army; the Royal Air Force to beat off any independent air attacks and to return them in kind by retaliatory bombing. We should not bomb first. We should wait and see if the Germans bombed and only then would we return the blows. Bombing blows as part of a larger system of attack were not considered. Yet all the time those attuned to the distant notes of destiny wondered; listened; waited. For them the

words of Stephen Spender came to mind at this strange period of lull before the full storm burst upon us:

"I have an appointment with a bullet
At seventeen hours less a split second—
And I shall not be late."

This was the sensation of foreboding that held the nation in suspense in those last days of April and early days of May 1940.

CHAPTER V

ALMOST pleasurable excitement prevailed throughout a large part of the population of the British Isles on the 10th of May 1940, when the Germans invaded Belgium and Holland. It was not that the horrors of war were not appreciated, but that the feeling was uppermost that the Allied preparations were sound; that the "lines" would hold; that the British Expeditionary Force with the French Army would throw back the Germans. The trial of strength had been long awaited; now it had come and there was a certain emotional release and a sensation of fulfilment. At 5.15 in the morning, without warning, one hundred German bombers rained bombs on Brussels. Parachutists were dropped at many points. The aerodrome at Schipol was bombed from a low level; at many points air attacks were made. The Air Ministry announced that the Royal Air Force had begun an offensive against aerodromes which the enemy had occupied in Holland. The Home Office in England, suddenly awakening to the possibilities of airborne troops which had been firmly ignored during the years before, issued a warning about parachute troops. A message from Stockholm stated that the open town of Kristiansund had been razed to the ground by five days of bombing. It was a beginning and nothing more. On the next day the Germans in a manner which was to become familiar by repetition intensified and built up their offensive. They poured in more troops, more aircraft, more guns. Junkers 52 troop-carriers were employed lavishly to put down airborne infantry at strategic points. Rotterdam's airport, Waalhaven was the scene of some of the most significant fighting, for here the Germans used airborne troops in accordance with the pattern they were later to employ at other points on a large scale. The German attack began at three in the afternoon and consisted in a double movement of air and land forces; the first stage being conducted entirely by airborne forces. The Dutch, fighting with the greatest resolution, although they were facing for the first time in history the full-scale three-dimensional attack, lost and regained their airports at various points but could not throw the Germans out of Waalhaven. The front had flared up and now the flames rose ever higher. The Royal Air Force went in with a will. Hurricanes were used to tackle the enemy's aircraft with much success. Blenheims went out to bomb enemy transport. In Belgium the enemy was harassed by air action.

The Germans sought to diminish the scale of the Allied air attacks by raiding, according to their reports, seventy-two British and Allied aerodromes. They claimed to have destroyed between three hundred and four hundred aircraft during these attacks. All the time the scale of the enemy attacks was mounting. The Belgian fortress of Eben Emael was reported as having been reduced by enemy parachutists. From every part of the front where fighting was in progress there came news of the use by the enemy of airborne troops of one kind or another. Airborne troops, although everywhere said to be in small numbers relative to the ground troops, dominated the reports because they were new.

And here a specific point must be made about the use of these airborne troops. During this stage of the battle, when the Germans were pouring in parachutists and airborne infantry wherever they could, the reports multiplied that some of these men were disguised either in the uniforms of the Allied forces or sometimes in civilian clothes. It was at this time that the famous story about the German parachutists disguised as nuns was started. It recurred in various forms almost every time parachutists were used in force; it occurred when the Germans used them and when the Japanese used them much later on in the war. We have to look at these reports to see if anything of importance can be deduced from them. And it does seem that they indicate a state of violent disturbance among those who are attacked by airborne forces. For there can be little doubt that the stories were mostly untrue. The illusion that the enemy parachutists were disguised was almost certainly the outcome of a state of the most violent confusion and this state is produced when attack comes from totally unexpected quarters. The parachutists were not a new thing. Most countries, if they had never experimented with them themselves, knew all about them. Yet when they were put in action on a large scale and with German lavishness, they did achieve a greater measure of disruption of the defences even than their most fervent advocates expected. It was a point worthy of especial note for it has reference to some of the sources of the power of the air; its swiftness and its ability to perform vertical outflanking movements and so create tactical surprise.

During these early stages the British public was almost looking forward to the time when the British Expeditionary Force would come into action. It had absolute faith in it. It believed in its commanders and in its equipment. It thought it would prove to be the best equipped army ever to go into action. Did these thoughts prevail among the higher command? Did

they prevail among the political heads of the Services? Did they prevail in the War Cabinet? It will be difficult for the historian of the future to state positively whether they did or not; whether there really was among the higher command any suspicion that the British Army was ludicrously ill-equipped to fight a modern war; that the use of air as an adjunct to land forces had not been properly studied; that air power would play a bigger strategical part than before, there is no means of knowing. Perhaps we never shall know. It will be difficult to distinguish wisdom after the event from wisdom during it. Perhaps we shall have to remain for ever uncertain whether the confident remarks made by the leaders of Britain, military and political, were the outcome of ignorance of the truth or of a praiseworthy but misplaced desire to hold up the morale (I anglicise the spelling) of the British public.

At any rate about this time the mortal danger of the British Isles was at last grasped. Mr. Chamberlain had given in his resignation and Mr. Winston Churchill, amid the acclamations of the whole people, became Prime Minister.

Some glimmerings of the power of the air were getting through. On the 13th of May Mr. Eden announced in the House of Commons the proposal to form a defence corps to deal with enemy parachutists and this afterwards became the Home Guard. So the Home Guard was in some measure the outcome of the early revelations of the power of the air. Then there was the bombing of Rotterdam which was done in the daylight after the Germans had beaten down the Dutch air defences. It consisted in the systematic, low level, dive-bombing of a small but densely populated area in the centre of the city. Great destruction was done and the loss of life was enormous. Probably the loss of life here was greater for the weight of bombs dropped than at any other place during the war because the raid was performed by short-range aircraft working in full daylight, without effective opposition, on an undefended town, not prepared to shelter its civilians fully against this kind of attack. It was stated at the time that the order of the Dutch Commander-in-Chief, General Winkelman, to his troops to cease fire was influenced in some measure by the torture of Rotterdam. It revealed the power of the air bomb when it is used on a place where there is no effective opposition.

All the time the Germans poured out their forces with the utmost lavishness. The fire and flame of war spread and became more deadly and more suffocating. The Royal Air Force had the opportunity to demonstrate its

heroism and took it. In spite of great losses it hammered at the enemy with every serviceable machine on which it could lay its hands. It strove mightily, shooting down enemy aircraft, bombing enemy positions. The Junkers 87 dive-bombers learned to fear the Hurricanes. On the 18th of May nine Hurricanes shot down ten Junkers 87s in a single engagement on the French front. German communications in the Meuse operations were bombed with all the force that could be mustered. Feats of the finest courage were of daily occurrence. And from England the long range-bombers went out to bomb places like Bremen and Hamburg.

This was the time when the delusion prevailed—and it will be referred to again when these historic days are interpreted—that Germany was short of oil and that her blitzkrieg could not be sustained for long if the Allies could strike at her oil-storage depots by air. So one of the tasks of the Royal Air Force was to bomb these depots. It performed that task to the full extent allowable by its forces. And the reports that were issued by the Air Ministry built up the hope in the breast of the British public that massive damage to the German oil supplies was being done. These reports, which later events showed to be far too optimistic, were worded to make it appear that every attack succeeded and that Germany was losing oil at an enormous rate every day. Alas, for these misguided attempts at propaganda by the Air Ministry! They were made with the best intentions; but they had the most unfortunate effects. They lead the British public to think that matters were going much better than they were; they ministered to the thing that was later to be called the cardinal sin: complacency. The Air Ministry, anxious to demonstrate its progressiveness, had moved ahead of the other two fighting services in the matter of its publicity and propaganda or "information" and "public relations" departments. And this department conceived it as its duty to its service and to the nation to build up and boost by every means in its power the activities of the Royal Air Force. As ever, however, the overplaying of the hand lead to the opposite effect. The daily stories of the flames and fire and the enormous destruction wrought by our bombing were accompanied by the more positively proved events in France and Flanders where the Germans continued to advance with unimaginable rapidity and to show not the smallest signs of shortage of oil. About ten to fifteen days after the German attack on Holland the British public was aware of the gravity of the situation. The almost pleasurable excitement which had swept them when they thought of the British Expeditionary Force going into action changed. It had been the outcome of their absolute, unswerving

belief in the courage and competence of their fellow countrymen. As far as the courage was concerned their belief was well founded. But the competence was not to be discovered.

It became clear that the German air force was able by its greatly superior strength to overpower the small British Air Component at any critical point it wished. Moreover it also became clear that the Advanced Air Striking Force was too small to influence in a marked manner the enemy's arrangements. The Royal Air Force had been split up, in contradiction to the first principles of war. Instead of being concentrated it was dispersed and it faced a highly concentrated enemy force. Looked at through the telescope of time how futile appear the diffuse struggles of the Allied forces against the mighty concentrated mass of the German forces. How absurd it was to disperse the air arm among numerous duties, under numerous different commanders and how readily this plan laid it open to a force concentrated, as was the Luftwaffe, and with its duties interwoven and integrated with the land forces.

As the German thrust at Sedan grew in weight and gained in effectiveness, so the demand for fresh thinking and better planning became more insistent. Mr. Winston Churchill announced his new Government and, as future air activities depended so much upon them, it is worth here noting the names of the members of the Air Council and of the changes made in that body. The following are the names of the Air Council before the German assault in France and after it.

<i>Before.</i>	<i>After.</i>
Secretary of State for Air	
Sir Kingsley Wood	Sir Archibald Sinclair
Sir Samuel Hoare	
Under-Secretary of State for Air	
Captain Harold H. Balfour	Captain H. H. Balfour
Chief of the Air Staff	
Air Chief Marshal Sir Cyril Newall	Air Marshal Sir Charles Portal
Air Member for Personnel	
Air Vice-Marshal Portal	Air Marshal E. L. Gossage
Air Member for Development and Production	
Air Marshal Sir Wilfrid Freeman	Air Marshal Freeman
Air Member for Supply and Organisation	
Air Vice-Marshal W. L. Welsh	Air Marshal C. L. Courtney

*Before.**After.*

Air Member for Training

Air Marshal A. G. R. Garrod

Director General of Production

E. J. H. Lemon

Civil Member for Development and Production

Sir Charles Craven

Additional Member of the Air Council

Sir Harold Howitt

Permanent Under-Secretary of State for Air

Sir Arthur Street

Sir Arthur Street

Particularly noticeable is the change in the Chief of the Air Staff from Sir Cyril Newall to Sir Charles Portal. But the change in the political head of the air service is hardly less important. Sir Samuel Hoare, who held the post of Secretary of State for Air for a short time after war broke out was one of the most successful peace-time Secretaries of State. It was he who sponsored the great airship experiments with the R33, the R100 and the R101. These experiments were unsuccessful, but they were none the less commendable. The spirit of enterprise and experiment tended too often to get mislaid by the political heads of the air service. Yet there was no department which repaid enterprise more richly. Sir Samuel Hoare was a successful peace-time air minister; but in war he was too greatly tortured by the tremendous problems with which he was surrounded; by the dreadful shortage of aircraft in the Royal Air Force compared with the enemy; by the difficulties of building up our strength quickly enough to meet the threats which he saw all round us. Sir Samuel Hoare was not complacent, or overconfident, most typical faults of those in the Chamberlain Government; he was the other way; too pessimistic, too worried, too overwhelmed by the awful impact of events. The more buoyant Sir Kingsley Wood was a better war-time Minister and he also was a fine peace-time Minister. Indeed we must pause here to state how much Britain owed to Sir Kingsley Wood, for it was during his term of office that the great Commonwealth Air Training Plan was brought into being and this proved the foundation of air training for the United Nations ever afterwards. Sir Kingsley Wood, cherubic, smiling, seemingly undaunted, was a first-class Air Minister. Some of those in a position to know believed that he was the best Air Minister Britain had had. He had not only helped to institute the Air Training

scheme, he had also given the fullest encouragement and support to the Civil Air Guard which was responsible for starting many young men on an air career which was to lead them eventually to posts in the Royal Air Force. But over and above these things Sir Kingsley Wood gave industry its opportunity. He opened the way for the British aircraft constructors to go ahead and to use all they knew in building aircraft. Sir Kingsley Wood was not an innovator; but a clearer-away of obstacles. He gave the right men their opportunities. He did not seek to interfere and make judgments about technical matters. He accepted the judgments of his subordinates provided he had tested them and weighed them one against another. Then he opened the way, beat down opposition and let the man in whom he believed have his head. It was the right way and we must never forget the debt British aviation owed to that curious, smiling little man who smoothed the way during one of its most difficult but also most critical periods.

But when the greater tests of air power were under way; when the power of air was being learnt and tried, then Sir Archibald Sinclair was Secretary of State. A thoughtful, careful, hard-working politician, Sir Archibald Sinclair was the possessor of an uninspiring manner of speech and a somewhat trivial presence. But he was the chosen man. Sir Kingsley Wood had helped to develop British air power in time of peace; Sir Samuel Hoare had held the post of Secretary of State in war-time for only about a month and the responsibility then fell upon Sir Archibald Sinclair. And Sir Archibald's minor inadequacies were made up for by his sincerity in the performance of his duties. In speaking he tended to stutter or to declaim, and this, together with his conception of the correct dress for a Minister, with butterfly collar and black coat, rather emphasised the politician at the expense of the statesman. But provided he spoke for long enough to enable his audience to weigh up the man, his sincerity broke through the feebler façade and inspired confidence. Sir Archibald Sinclair cannot be held to have forced Britain's development of air power, nor to have provided it with any special drive or impetus. He did not oil the wheels of the aeronautical industry as Sir Kingsley Wood had done. But he did perform with lasting sincerity and quiet firmness the duties that were entrusted to him. Not an innovator or a prophet; not a mighty leader or a man of drive and energy; Sir Archibald went about his work quietly and correctly and in this way he gave, perhaps, more opportunities to his officers. Captain Harold Balfour, the Under-Secretary of State, came to office as successor to Sir Philip Sassoon, knowing far more about aviation than anybody else in Parliament. His real knowledge

of flying and of flying machines; his war-time experiences and his imaginative gifts all combined to make him an Under-Secretary of the highest value to the reigning Secretary. Consequently it was not unexpected that when Mr. Winston Churchill became Prime Minister and appointed Sir Archibald Sinclair to the post of Air Minister, Captain Balfour should retain the post he had held both under Sir Kingsley Wood and under Sir Samuel Hoare. With the sensitiveness and insight of an artist rather than a politician and with genuine air experience as a pilot of all types of aircraft, Captain Balfour must often have been the strength behind the Minister.

And now, with the war situation at its blackest, these men were to go through their sharpest trial. And whatever may be said of them, whatever their executive faults and failings; whatever their failures to achieve the genuine vision of air power, it must be said that they stood firm and that they supported their subordinates with calm, sustained resolution. The English politician is the butt of the populace. He cannot posture before the crowd, for posturing is a thing the crowd invariably turns to comic effect. He is abused and maligned. In return for his little, short-lived power he must stand up to strong criticism and, what is worse, to ridicule and belittlement. But he does, when the country is endangered, show always the same truth of spirit and the same steadfastness. English history does not contain many intentional traitors and its weak and unthinking statesmen are usually firm on one thing; their determination to do their duty at times of crisis.

And this was a time of supreme crisis. The Germans were throwing in their weight with sinister purpose. Every stroke they made showed an unwavering determination to break down the Allied resistance. The calculated intention of the enemy's stroke began to show through. It was to split the Allies, to force a knife between the Belgians and the French, between the French and the British; to divide and then to destroy. Britain watched breath-bound as the enemy mechanisms crashed and clanked forward. Rumour constantly painted too bright a picture. It was always countered by the statements of the German High Command. Rumour said that the Germans were running short of oil; that prisoners captured showed that the German troops were exhausted and anxious for the war to end; that all kinds of troubles were afflicting their tanks and armoured vehicles. But the facts grew out of the movements of the troops and the movements of the troops eventually revealed themselves through the fog of false report. The British people read the *communiqués* from the German High Command with growing exasperation. They proved to be nearly always

right while the Allied statements proved to be nearly always wrong. This was the period of frustration and fury; of the gradual recognition of the strength and power and drive of the forces ranged against the Allies; of the ingenuity of the method of the blitzkrieg and especially, and above all, of the power of the air when integrated with the power of the land. By now the air forces in France had been placed under the command of Air Marshal Sir A. S. Barratt. It was a step towards integration, but how far from achieving the kind of integration that was needed was not at the time clear. For this period was a contest between integrated land and air forces and separate land and air forces working in co-operation. It was also a contest between one military force against two military forces (the French and British) working in co-operation. The complete integration of the German forces made many things possible that were not within the power of the defenders; but among them must be put the fact that the enemy was able to use the weapon of confusion to his advantage and that in using it he employed air power in a manner not clearly foreseen.

The Junkers 87 dive-bombers were used as artillery, to open the way for the ground forces. The sequence was approximately as follows: the German air force first reconnoitred a position or at any rate brought their reconnaissance photographs and reports up to date for they maintained reconnaissance from the start of the war; then it launched medium-range bombing attacks usually with Dornier 17s and Heinkel 111s escorted by fighters. The object here was not only to bomb; but also to help to clear the air from enemy opposition. The bombers drew up the Allied fighters, and the German fighters were then able to attack them with the special advantage that the Allied fighters could not concentrate to the extent the German fighters were able to do because they still had to guard a "front" which included the whole length of the Maginot line where the Germans did not in fact attack in force. The next stage was the more critical one where Junkers 87 dive-bombers were employed to blast a way for the German Panzer divisions. These dive-bombers worked in closely with the ground forces. They had been trained with them and their duties were closely interwoven with the duties of the land forces. The use of this attack formula led to the introduction of the element of confusion on a larger scale perhaps than in any previous war. It has been mentioned that the dropping of parachutists led to reports that the Germans were employing all kinds of disguises, including that of a nun, and that in fact there was little or no really trustworthy evidence that the Germans ever used disguises for their parachutists

in any of their military operations, which are not, of course, to be confused with their spying operations in which parachutists wearing various disguises were dropped, mainly at night. But by day in the military operations the German parachutists were in uniform. It was the fact that their use, coupled with intensive dive-bombing, and with long-range and medium-range bombing, created confusion that led in turn to false rumours of disguises. We must recognise confusion as a complement to the employment of air power on a full scale. The parachutist creates confusion; the bomber helps to create confusion and when parachutist and bomber work in close combination as the vanguard and accompaniment of a full-scale armoured attack, the results are to create confusion in wide areas. It was this creation of confusion that aided the Germans. Although I have expressed the belief that the Germans did not use disguises for their parachute troops engaged in military operations, I am less certain that they did not deliberately machine-gun roads on which refugees were jammed. Whether they did or not they attacked points so close to the columns of refugees that it will never be possible to get rid of the belief that deliberate attacks on the refugees were made during the advance across France. And in any event the confusion on the roads was the outcome of the use of aircraft, and it was a weapon which favoured the German advance.

Now a few flashes of events must be given and then the attempt made to summarise this period of awakening as the German troops swept through the low countries and then through France, divided the Allies and finally flung the small, ill-equipped, unscientifically led, but still supremely and unshakably courageous British Expeditionary Force, with its Air Component, and with the Advanced Air Striking Force out across the Channel from Dunkirk. Dunkirk! That word still stands as the strangest evocative word in the world; a word which brings back a great shame and a great awakening; which is a reminder that the spirit of sound men is deathless, but that there is frustration sown when it is not backed up by thinking plans and up-to-date methods.

Now the flames roar again over France. At French headquarters astonishment and wonder grow. Rumours increase in wildness. It is reported that gas attacks are being made, and again that warnings of gas attacks are being given by the enemy without the actual use of gas; that "parachute bombs" are being dropped by the Germans and that these burst and scatter many small bombs (here rumour had obviously got hold of a small particle of truth about what later came to be well known. General

Gamelin had issued his inspiring Order of the Day and was replaced by General Weygand who came to his tremendous task holding the view that the result would be settled one way or another within twenty-four hours. That fact is stated in "The Diary of a Staff Officer," and the author makes also this comment: "The striking power of our bombers at home is being employed deep in Germany in place of concentrating closer in on the river crossings of the Meuse and the Oise and so creating disorganisation, particularly at night, in the area immediately behind the German advance positions. The Germans are being allowed to rest at night as peacefully as they would at home. There is no harassing fire. Artillery has been used very little by either side since the pace of the advance has outstripped the German guns and the Allied artillery is hardly in position before it is either deserted or hauled away in the course of the retreat. Aircraft represent the only form through which the harassing fire of old days can be reproduced to-day."

That view deserves special note for it was later to be confirmed in other theatres. In the allied forces there was still this fateful division between the air effort and the land effort, with the air effort being directed at doing something that might have been done by forces twenty times the size, but which was entirely outside the range of possibility with existing forces; that is it was trying to check the German course of conquest by long-range strategical bombing, independent of the actions which were being fought on the land in France and Flanders. This same point occurs again and again in the reports and statements of Army officers. Here is another comment: "Last night Bomber Command again bombed the back area as far east as Aachen, Geldern, Roermond and Weert. The bombs are needed closer in to harass the already exhausted German troops who have to be beaten where they stand in the next forty-eight hours or we lose the Channel ports for good." It was a thing which was clear mainly to junior Army officers. It was not clear to the higher officers of the Royal Air Force at the time. They clung tenaciously to the theories of Lord Trenchard, and did not weigh them against their resources and against the enemy resources. Nor did the higher command see the point. Weygand, schooled in the past, did not, in spite of his great genius and his vast experience, see that the bomber force in Britain might be better employed than it was and might give the land forces respite enough to save them. We look back at this desperate period, while Weygand, in whom everybody in Britain placed implicit faith, flew back and forth to try and mount a counter-attack, and we see or begin to see the errors and omissions of the Allies. We see the futility of that emotional forward rush of

the British Expeditionary Force into Belgium as the German attack was launched; we see the fantastic delusions which rested on a Maginot line that covered only a part of the front. We see above all the absence of close air support for the Allied land forces and the dissipation of the total air effort available on things that were of secondary importance. But even now, seeing these things, we can hardly say that if they had been grasped then by those in command they would have been able to hold the enemy. For it has since emerged that the enemy was much stronger in aircraft and in mechanised fighting vehicles of all kinds than the Allies. At the outbreak of war the guess which was later made was that the German air force disposed more than 4,000 aircraft in the first line, meaning that the total number available must have approached 30,000. It seems doubtful if any superiority in tactical planning could have saved the Allies at this time, though it is certain that it would have made the subsequent German successes less likely. I quote again from "The Diary of a Staff Officer." In the entry date the 3rd of June, 0915 hours, the author writes: "Attention now turns to the policy to be adopted in regard to the Air Force in France. At the moment the A.A.S.F. (Advanced Air Striking Force) is down to some seventy bombers and thirty fighters. The various staffs include nearly 400 officers, strength in other ranks including M.T., signals and aircraftmen runs to some 12,000 men. The M.T. includes 2,000 lorries. For the moment, in craft, it has become a token force only. It is unfair to criticise at the moment when events have moved intolerably fast, but to many of us—in fact, all of us—now that we seem to be robbed of the possibility of usefulness out here the waste in time and material is very troubling." And again in the entry date 5th of June: "Yesterday the Army 'cell' as we describe ourselves, justified its existence politically, Woodall was able to draw attention to the attitude of the Army towards the R.A.F. The Army has been making very adverse criticism. It accuses the R.A.F. of abandoning the B.E.F. during the retreat. We even hear that the soldiers spit on the ground when they see the Air Force uniform." That is a tragic circumstance; that two services manned by men of the same country, men of the highest probity and the finest courage and resolution; men capable of all feats of arms that are within human range; it is tragic that such men should, by the inadequacy of the understanding of the higher officers and their failure to grasp the essentials of the air weapon and of its use in modern war, should be brought to distrust one another. No more serious and solemn thing could have been possible at this critical hour for in such beginnings are the crash of empires and the

subjection of great countries. But the freedom of criticism then allowed, and the freedom of speech, did bring these things home and make all understand that there had been some failure in the air support supplied to the land forces of the Allies; and they did also present the first glimmerings of true appreciation of the position of air power in war. They began to show that the air way had dug deeply into earlier conceptions of war as of peace; that the wider and speedier scope allowed by air transport had transformed the face of peace and war. Had the truth of the effects of air transport on the expanding community been earlier grasped, it would have been an easier step for the politicians and for the Service officers to grasp the other truths thereon dependent; the truth of the integration of air with land and sea. But the fall of France was the awakening. From that time on there was urgent questioning, urgent examination, urgent criticism. The application of air power so that a land force could hold or make progress was thenceforward a matter of concern for all. Britain discussed this problem everywhere and in that way it was a test of the ultimate efficiency of a democracy. Could such discussion bring to light the truth? Could it yield practical results soon enough? These were the questions. For it was clear that such frank discussion, by sifting thoughts and promoting others, could in the end arrive at the ultimate truth and it remained only to see if it could arrive at it in time. The awakening was more than anything else an awakening to the fact of the inter-dependency of all fighting forces and to the conclusion that the air force, as it overmanned all other forces, must work in with other forces. The conception of the air canopy as being not only desirable, but essential to land and sea operations began to gain ground. It was a beginning.

Finally, we must look at the larger picture of this great British disaster at arms, of the events which culminated in the blood and tears and triumph of Dunkirk. To do so we have to turn to the despatches from General the Viscount Gort, Commander-in-Chief, the British Expeditionary Force in France and Belgium in 1939/40 to the Secretary of State for War published as a supplement to the *London Gazette* of Friday the 10th of October 1941. Lord Gort was the normal type of British Army officer; a man of unimpeachable probity, simple religious faith, the deepest sense of duty and tempered courage. His face, unsmiling, patient, placid, became familiar to the public. They believed in him, and if courage and devotion to duty could have won the day and driven the Germans out of France Lord Gort would have done it. His despatch is one of the fine documents of the war. A model of restrained, objective statement of fact; a good example of

unemotional reporting and military terseness, this document also showed that Lord Gort was conscious of the essential part that aviation ought to play in great land campaigns though perhaps it reveals that he did not think on a sufficiently large scale. But who shall say that his failure of full vision was his fault or whether it was the fault of a country which had failed to notice that the very structure of its wealth and of its dominion over land and sea had been sharply modified by the coming of air? If British statesmen had not noticed that sea strategy was not of itself enough to secure the British Empire, how could a simple soldier be expected to see it? These were matters for the statesmen and not for the soldiers. The soldiers were kept in peace-time without money or *réclame*. They were kept out of sight in the corner. And so this document from Lord Gort must be recognised as a tribute not only to his simpler qualities, but also in some measure to his qualities of military insight. It will be necessary here to quote some of those passages in which Lord Gort referred to the part played by aviation during the period from the 3rd of September 1939 to the 31st of May 1940.

First, there was the process of conveying the British Expeditionary Force to France, and here at once air power exerts an influence. "The plans for the despatch of the Force differed in two important respects from those of August 1914" writes Lord Gort. "The possibility of attack by sea and air made it necessary to use the western ports of France instead of the Channel ports, while the total replacement of animals by mechanical vehicles, which had been completed by 1939, presented a new problem in transportation. The troops were landed at Cherbourg and their stores and vehicles were despatched to Nantes, St. Nazaire, and Brest."

Thus the speed of the air arm was at once slowing down the rate at which British troops could be brought to the fighting line. No measure of counter-speed had been devised or even thought possible; the conveyance of armies by air was still regarded as a dream of some remote future. So air power had a positive effect on one side—the enemy's—but a negative effect on the other side. By giving the enemy more speed in striking it reduced the British speed in coming into action. It is, perhaps, a digression, but it is just here to mention that Lord Gort prepared these despatches for publication when there was much bitterness against France for having failed, as was thought in Britain, to hold to her commitments to her ally and yet that Lord Gort paid tribute to the French and noted how "drivers and vehicles were on the road for long periods, but their duty was lightened by the hospitality of the French inhabitants, which all ranks will recall with gratitude." When

national feeling sways violently from side to side and when foreign countries are at one moment regarded as bosom friends and at the next as treacherous enemies, it is good to find this soldier holding to the facts as he saw them, uninfluenced by the whirling passions of the moment. After the transport problem there was the problem of dispersal of the forces so that there was no undue risk from surprise air attacks. "In these early days," Lord Gort says, "the Staff met for the first time the problem arising from the wide dispersion imposed by the necessity to guard against air attack. . . . The dispersion . . . greatly increases demands upon signal communications and transport and thus lengthens the time which must elapse between the issue of orders and their execution."

Here again air power is seen to be working for the enemy and giving us no relieving advantage. Its effects are all to add to our difficulties and dangers and not to add to those of the enemy. It is the outcome again of the failure of the country as a whole and especially of its statesmen to see air power as a dimension of the three-dimensional manifold of peace and war and to observe how it inevitably affected the integrity of the earlier British and Imperial strategy. So Lord Gort went not only without adequate equipment in the form of tanks and guns and aircraft; but also without adequate equipment in the form of understanding and the concept of the three-dimensional manifold which was henceforth to be the frame of all strategy and all tactics, which the enemy had partly seen and partly explored.

On October 27th five divisions of the British Expeditionary Force were in the line, and by the end of January it consisted of 222,200 men of all ranks, not including the men of the Air Component and other units of the Royal Air Force. The composition of this force: "included a Component of the Royal Air Force under the command of Air Vice-Marshal C. H. B. Blount, Royal Air Force, consisting of two Army Co-operation Wings, one Fighter Wing and one Bomber Reconnaissance Wing. The aircraft were flown to France according to plan at the outbreak of hostilities, and came under my (Lord Gort's) command from the dates of the disembarkation of their ground units. Later other units were added, and the Air Component now comprises, in addition to Headquarters, one Fighter Group Headquarters, eight Wings, a Communication Squadron, and certain administrative and other detachments. The ground echelons were moved in advance of 1st and 2nd Corps to the aerodromes in the region to be occupied. In the early stages they were largely dependent on the assistance given them by the French Région Aérienne under the command successively

of General Jauneaud and General Armengeaud. On 14th and 15th September the anti-aircraft units disembarked at the base ports and, in conjunction with fighter units of the Royal Air Force, undertook the task of protecting the disembarkation of the two Corps and their forward moves. Once the concentration was complete, the available anti-aircraft resources were divided between forward defences and lines of communication. Besides the normal provision for the defence of headquarters and railheads, arrangements were made to protect certain important French installations in the British zone and a searchlight zone was also established as a protection against enemy night bombing. On all occasions, the Air Officer Commanding has been greatly helped by General d'Astier, commanding the French Air Force with the northern group of French Armies. During the period under review, enemy air activity has been almost entirely confined to reconnaissance flights at great heights."

Air reconnaissance plans for the Allied forces were worked out in conjunction with the Air Ministry and with General Mouchard, commanding the air forces with the French armies in the north-east. Many reconnaissances were made both by day and night and much photography was undertaken. "The work of the units of the Royal Air Force engaged in air reconnaissance," writes Lord Gort, "deserves the highest praise, since it has been performed as a rule in the face of enemy opposition. Pilots have often been called on to carry out flights to the full limit of the range of their aircraft, flying over long and circuitous routes to avoid neutral territory; this rigorous duty has been boldly and cheerfully undertaken." It had been decided, before mobilisation, that the maintenance and construction of all aerodromes used by the Royal Air Force in France, as well as their signal communications, should be the responsibility of the British Expeditionary Force. Many aerodromes and landing-grounds had been placed at our disposal by the French, but the problems of construction and maintenance were found to be far greater than had been contemplated before the war. A new policy was formulated and plans prepared. In most parts of France permanent pasture does not exist, and this fact, in view of the weight of modern aircraft, Lord Gort explained, made it necessary to construct concrete runways, often of considerable extent, on the principal aerodromes in use. A number of special units of the Royal Engineers had to be raised and a large amount of plant, grass seed and materials had to be provided. Lord Gort again refers to the new problems facing the commander in the field owing to the increased power of the air when he says that the degree of dispersal required

materially added to the difficulties of the Royal Corps of Signals which had to provide communications for both the Army and all the air forces in France. Lord Gort's first despatch ends with a note on the visit of the King to his troops in France and to the enthusiasm with which he was received. How facile are such enthusiasms and how often they wane and even turn sour under the stress of disappointment and defeat. But these enthusiasms, to the credit of the British soldier, did not turn sour under disappointment and defeat; they only lost their joyousness.

First intimation of the next events to come is contained in the opening part of Lord Gort's second despatch which covers the period from the 1st of February 1940 to the 31st of May 1940. The operations are divided into three parts; the advance to the Dyle from 10th to the 16th May; the withdrawal from the Dyle to the Escaut from the 17th to the 26th May with the defence of the Belgian frontier and of the southern and western flanks and finally the withdrawal and embarkation of the Expeditionary Force from the 27th to the 31st of May. The 31st of May was the date on which General Headquarters closed and the Commander-in-Chief, Lord Gort, left France for England. But operation "dynamo," as it was called, that is the evacuation from Dunkirk, carried on until the 3rd of June, and an Appendix to the *London Gazette* of the 17th of October 1941 deals with this. As Lord Gort takes up the narrative from the 1st of February there occur in his quiet, objective statements, the hint of fearful undercurrents of difficulty and defeat. Reinforcements instead of going to France have to be diverted elsewhere. Lord Gort notes the fact without complaint, "His Majesty's Government found it necessary to postpone the despatch of 3rd Corps (excepting 51st Division) and also of certain anti-aircraft, administrative and labour units. I was also instructed to earmark one division for withdrawal from the B.E.F., if required; for this I selected 5th Division. It was evident that the programme of shipments of ammunition and other war material to France, on which I had counted to make up the serious deficiencies in stocks, would be severely curtailed in February and March. These changes entailed a delay in the development of the Force which was naturally disappointing; moreover it became impossible for me to take over the new sector to Bailleul, and at the same time to retain a proper proportion of divisions in reserve. I was, therefore, obliged to obtain the consent of the French to the indefinite postponement of the relief, and to accept the resulting congestion in the area of the B.E.F."

After the new situation had been created by the German invasion of

Denmark and Norway on the 9th of April leave was stopped in the British and French Armies, and the 5th Division was despatched to England *en route* for Norway. "Reports of enemy intentions to invade Holland and Belgium," Lord Gort says, "were received from different sources and at different times, and between the 11th and the 22nd of April certain troops were placed under short notice to move. Intensified air reconnaissance was ordered in the zone allotted to the Air Component which included part of the Ruhr and the area to the west of it, but apart from small bridging activity no positive results were observed." Lord Gort again mentions the shortage of equipment and states that he had on several occasions called the attention of the War Office to it. There is in this part of the despatch a frigid exposition of the inferiority in which the British Expeditionary Force found itself through shortages of various kinds and through the diversion of troops to other fronts which is all the soldier in Lord Gort permits himself. But he does not see the most serious shortage; the shortage that was to lead to reverses in many other battles on many fronts; shortage of vision of air power. There had been no attempt to extend and expand air power as part of a three-dimensional fighting manifold. There had been no conception of it in this framework. That was where lay the most damaging and most dangerous shortage of all. In their reference to air activity there is evidence that not only Lord Gort, but also Royal Air Force officers had not fully appreciated that air power would be used differently in the war of 1939 from the way it was used in the war of 1914-18.

"On 15th January 1940," Lord Gort writes, "Air Marshal A. S. Barratt had assumed command of the British Air Force in France, including the Air Component, which, however, was to remain under my operational control. Under this arrangement, in my opinion, the control of available air force was better allocated to meet the needs not only of the British but also of the French Army for whom considerable aerial reconnaissance was being carried out. The development of the Allied Central Air Bureau and of its communications to the headquarters of higher formations in France and to the Royal Air Force at home, was likewise to prove its worth in the days to come as an organisation for co-ordinating information and requests for air action.

"At the same time I felt that the resources of the Air Component would prove insufficient for the requirements of the Force during operations; so long, therefore, as this state of affairs existed it was of prime importance that the machinery for obtaining the allotment of additional bomber and fighter

support should be as simple and as swift in operation as it could be made.

"Throughout the period, construction of new aerodromes, landing-grounds and communications for the British Air Force in France was proceeding as fast as resources would permit, concrete runways being constructed in the early part of the year until the season allowed for the sowing of grass. Upwards of 10,000 men were employed on this work, and forty-seven aerodromes and satellites (including nineteen new aerodromes) were under development or construction. By 15th of May eight of the nineteen new aerodromes were capable of use, and at least 50,000 tons of concrete had been laid. Constructional work was also undertaken on behalf of the Air Ministry at other R.A.F. installations in central France."

Nothing, it will be observed, in the despatches of this fine soldier and courageous man, indicates that there is at general headquarters any full understanding of the part that air power might play. There is always the harking back to history; always the expectation that air power would repeat itself and that everything would be the same. That is the summary of the operations in France; the British expectation that everything would be the same; the German determination that everything would be different. The Allies saw air power as a means of reconnaissance and of giving a minor kind of support to Army units; the Germans saw it as integrated with their armoured units, working as a battering ram to prepare the way for the armoured units. In spite of this allied view that everything would be the same, there was all the time a background hesitancy and an instinctive fear of air. That was why Lord Gort when he moved into Belgium to the Dyle had to use roads which skirted Brussels; for Brussels had been declared an open town, and in order to protect it from bombardment from the air the land forces were handicapped. Here was this strange duality of thought shown once more. The Army could work without much more air support than it had in 1918, yet air power was so strong in the attack on cities that it was worth going to almost any lengths to confer freedom from that attack.

On the 12th of May the first lesson on the battlefield was provided. "The day," remarks Lord Gort, "was one of great activity in the air, and afforded great opportunities for the Royal Air Force to impede the enemy advance; but such opportunities were of a fleeting character, since the enemy established strong anti-aircraft defences soon after his arrival, particularly in towns at which roads converged. Tactical reconnaissance became virtually impossible without fighter support, and the demands made on the fighter group

of the Air Component were extremely heavy. They had been met with unfailing skill and courage, and with marked success, but by now the group was reduced to some fifty aircraft, and although I had asked for four fresh squadrons from home, only one had arrived. In three days' operations, the British Air Force in France had firm reports of the destruction of 101 enemy aircraft, mostly fighters, against a loss of 78 of our own."

Here is further intimation of the fact that the Allies expected everything to be the same while the Germans were determined that everything should be different. The Germans had arranged to give massive air support to their land forces and, in completion of the scheme, they had taken the converse measure of providing powerful anti-aircraft artillery for protecting their land forces against the kind of air attacks which they themselves proposed to launch upon our land forces. On the 18th of May the bulk of the Advanced Air Striking Force, now seen as a pitifully inadequate piece chipped off the small bomber resources of the entire Royal Air Force, moved from the neighbourhood of Rheims to Central France and the Air Component moved one of their main operational aerodromes from Poix to Abbeville. On the evening of the 19th of May enemy action obliged them to evacuate this aerodrome also. The Air Officer Commanding the Air Component then moved his headquarters to England, but an advanced landing-ground was maintained at Merville until the 22nd of May. Then Lord Gort goes on, and this sentence has special importance: "From the 21st of May onwards all arrangements for air co-operation with the B.E.F. were made by the War Office in conjunction with the Air Ministry at home. The air liaison work was carried out in England at Hawkinge and the targets selected in accordance with telephone or telegraphic requests from the B.E.F. so long as communications remained open, supplemented by information received from the Royal Air Force and other sources." We can afford now to recognise this as a fantastically inadequate arrangement; but at the time it appeared an unavoidable improvisation suited to the special conditions.

Towards the end of his second despatch Lord Gort, under the heading "The Employment of Air Forces" sums up his conclusions from the campaign in France in these terms:

It was clear from the reports of the Spanish war, confirmed by those of the Polish campaign, that the enemy would employ his air forces to further the offensive operations of the army by the use of dive bombers and parachute troops. The latter, though effectively employed in Holland, were less used against the B.E.F.; however, the nuisance value of those which were

employed, by their interference with railway, telephone and telegraph communications in rearward zones, was altogether out of proportion to their numbers. There were seldom troops available to isolate and search the areas where they landed, usually at dusk, and no French civil organization existed for the purpose.

The enemy bombers, both high level and low flying, were a more serious menace. Their control by the German command was most efficient, capable of bringing the aircraft to their objective by wireless call at short notice.

Attack by dive-bombers was a new experience for British troops. Even those who had grown accustomed to heavy shell fire in France during 1914-18 found that this form of attack, when first encountered, placed a strain on morale. As had been expected, it was soon realised that those who were properly entrenched and had perfected the drill of taking cover when on the move, suffered relatively little danger.

Ground anti-aircraft defence, both gun and light automatic, improved in accuracy as time went on and it accounted for the destruction of over 500 aircraft in addition to its effect in breaking up formations of enemy aircraft. But being purely defensive, it can never prove the complete antidote to enemy bombers and reconnaissance aircraft, even when available in sufficient strength. A commander must have at his call sufficient fighters to intercept and attack the enemy.

The commander must, likewise, dispose of a sufficient bomber force to be able to engage opportunity targets of vital tactical importance. Such targets were the enemy mechanised columns at Maastricht, Sedan and Boulogne. The machinery for their control must be efficient enough to ensure that aircraft can be despatched in time.

Finally in his Appendix Lord Gort says: "Successful operations on land depend more than ever before on the closest co-operation between aircraft and troops on the ground, and the B.E.F. owes a deep debt of gratitude to the Royal Air Force for their work throughout the operations. Pilots returned to the air again and again to carry out essential tasks for both French and British Armies when they were long overdue for rest and sleep. The embarkation of the Force would have been well-nigh impossible but for the fighter protection afforded. The toll taken of the enemy aircraft on this and earlier occasions has once again established the individual superiority of the British airman in the air."

It has been necessary to dwell at some length on these despatches although

against the larger canvas of the war the fighting in France and even the evacuation from Dunkirk appear as a mere episode, because they represent the awakening. They are the first intimation that something was wrong in the allied conception of war and more especially in the allied conception of the part that the air arm ought to play in it. There is tragedy in these despatches, and it is not only the tragedy of brave men frustrated rather than outfought; it is the tragedy of a last farewell to old ways and old thoughts and old traditions. The British Empire, the British Commonwealth of Nations together with the Colonial Empire, had not seen during the days of peace that new forces were at work in the fabric of world distribution. They had not noticed that the coming of the aircraft would in the end pave the way, as the horse, the railway train, the ship, and the motor-car, had paved it in the past for the expansion of communities and that the communities would be bound to respond. They had not seen that those who trusted in the air would obtain their reward from the air. So those days of May and early June 1940 are heavy with meaning. But the new way of thought, the new air conception of world communications and world war could not come at a stroke. The conclusion of the operations in France left the British public still questioning. They had seen fine soldiers and good men overwhelmed and they had noticed that the exercise of air power in a specific manner by the enemy had had much to do with it. But it was still a period of groping for answers rather than of full appreciation. To-day the full appreciation is possible; but then it was obscured by many things and among them the conservative and traditional conceptions which wrapped around all British soldiering. It is no discredit to the soldiers to say that. Their view was never that aeroplanes being "new-fangled" things should on that account be excluded as weapons of major importance. That conception, in spite of some of the critics, never prevailed in the British Army. On the contrary, all officers and men were anxious to give the aeroplane its fullest chance and to use it to the fullest extent. But how should it be supposed that the soldiers would see more clearly the scope of the aeroplane than the statesmen and commercial magnates? If the great business houses of before the war, the multi-millionaires of prosperous peace-time England; if the ponderous, slow-moving statesmen of that period had failed to notice that the air way was altering the fabric of world life; if they had failed to notice that the air way gave a fresh opportunity for the display of the instinct of all communities to expand to the limits set by the communications available; if these brilliant business men and these unharassed statesmen had failed to see this power

of air, why, it may well be asked, should it be expected that the soldier who, in peace-time had been starved of money and of interest, and even of popularity, should have seized upon these things?

The British Army officer was as alive to air power as the British business man or the British statesman, no more and no less. But after the retreat in France he still sometimes refused to believe that the British peace-time preparations for the employment in war of air power had been totally misguiding and totally inadequate. He honestly, and out of his own free reasoning, tended sometimes to underrate the power of the air. It was not foolishness; nor was it deliberate obstructionism. It was not jealousy or any other of the tawdry reasons that have been advanced to try and throw the blame on someone. The British Army officer saw the power of the air just as much and no more than the British nation saw it. So the retreat in France could not be expected to be more than the awakening and after that there still had to come the fuller appreciation of the position. The air concept had to soak through and through a country which had relied upon the sea for security. It had to get home to a people that thought of carrying and of transport in terms of the sea first of all and, secondarily, in terms of railways. Only after ships and railway trains did they think of roads and motor vehicles, and only last of all did they think of aircraft. It was partly attributable to the statesmen who failed to see the deeper meaning of the coming of air transport; but it may also have been partly attributable to the fact of England's geography. In the small spaces of the British Isles air transport had not had the opportunity to demonstrate itself near home. Only on the long Empire routes could it do that, and those Empire routes depended upon a prior realisation of the power of the air which never came.

But now there was the awakening in France; the sudden appreciation that Britain at peace had failed in vision and had failed to understand the greater meaning of air power. There still remained to be taught the full lesson. It came swiftly. It came with blinding clarity. It came in the greatest disaster British arms had known, the mightiest tragedy of modern war, the evacuation of Dunkirk.

CHAPTER VI

DUNKIRK was the word that was to follow British war activities for months. When used by the enemy it was to become a term of ridicule and abuse, a term designed to imply that the British ran away from their military responsibilities and were invariably in retreat, having to be rescued by the Royal Navy after ludicrously inadequate attempts to fight on land. When used by the Allies the term Dunkirk was to mean the power to snatch from disaster the ability to continue the fight; the determination to go on in face of apparent defeat; the whole country's dour resolution. But Dunkirk was also the moment at which a better understanding of the power of the air came upon the British people. There had been the awakening in France, when the cry give us aeroplanes had echoed from the fighting line and reached England. It had then been understood that to fight a successful war on land the land forces must be supported by powerful air forces which could bomb and fight. But understanding of the wider implications; of the three-dimensional manifold of all war operations under modern conditions was to come only with Dunkirk. It was during the fighting from the 26th of May to the 3rd of June; during the operation "dynamo" that understanding came. For Dunkirk would not have been possible without the Royal Navy and it would not have been possible without the Royal Air Force. It was the continuum of the three Services. The Royal Air Force did not undergo any miraculous expansion in readiness for Dunkirk. It was exactly the same size, to all intents and purposes, as when it was intervening so ineffectually in France. But this time the pressure had been applied and it was known that everything must be thrown in. The forces were focused at a point. So, at Dunkirk, the Royal Air Force did, for the first time, concentrate all the strength it possessed on one task. That was where there is a sharp line drawn in the understanding of the power of the air between the retreat to Dunkirk and the evacuation from it. In the retreat the Royal Air Force components working with the Army, in spite of the skilful and courageous efforts praised by Lord Gort, had not been sufficiently strong to do much and had been harassed and worried in a series of moves from aerodrome to aerodrome. But at Dunkirk there could be no moving and the cry of those trapped men went back to England to arouse there the absolute determination that they should be

saved. Our Army was trapped and in danger of annihilation. The vast German Army was rushing down upon it as it stood with its back to the sea. Here, if ever, was a comprehensive picture of British hopes and fears and virtues and beliefs. The Army had moved back to the sea as it became clear that defeat in France was imminent. It was an inevitable move. The British Army would have found it impossible to retreat in any other direction but that. It was the sea that had saved and held Britain in the past. Now the sea would save her again. The bedraggled Army moved towards the sea; believing as it had always believed in the Royal Navy. The Navy would save them. From the Royal Navy went the same thought out to the Army; move to the sea and we shall be there. As yet the Royal Air Force was not in the strange, nightmare, thought-picture that arose in the minds of every Englishman. They thought of the sea, the salt sea which they believed in and which would come to their rescue at the eleventh hour. But as the battle swung, smoking towards the sea, the realisation that something might be missing came upon everyone, and then they wondered about the air. But in fact the Royal Air Force had also gradually appreciated that the sea alone could not this time save the British Army. And in fact the Royal Navy had appreciated that it could not alone save the British Army. Both became aware that only the air together with the sea would be able to achieve this feat. It was the great understanding. The great epitome of war experience; the first three-dimensional, three-Service continuum of war.

In the war of 1914-18 it had been estimated that about 7,600 bombs fell in and around Dunkirk. But now, in nine days, many more than that were to fall. The enemy was savage in his determination not to let his prey escape; not to allow the sea to save the British Army, and he saw the way to be through the air. The enemy proposed to prevent the Royal Navy from coming to rescue the Army by striking heavily from the air. It was to be a trial of strength between air and sea as he saw it. The enemy's target is well set out in John Masefield's work on the subject. "When the first troopships sailed for Dunquerque," he writes (personally I like to anglicise the spelling), "it had been arranged that two ships should call every four hours at the jetty, while drifters should stay off the beaches to receive men ferried out by motor-launches. The first ship of the operation returned to Dover with troops at 10.30 that night (the 26th of May) her load was of 1,312 base units and lines of communication men. Dunquerque had been frequently and heavily bombed daily and nightly for some weeks; it was on fire in many

places, and blazing to heaven from its oil-tanks. . . . Wherever his (the enemy's) bombers flew they had a perfect target beneath them, columns crowded on roads, shipping crowded in a channel, masses of men upon a beach. During the week there were three hundred and fifty thousand men shut in within a narrow compass with all their possessions; and bomb-dropping anywhere inside the perimeter was certain to be destructive. These bombers and their masters exulted at the sight. For the first time a great German encircling movement was to be helped to complete triumph by mastery in the air. Sedan had been a victory; this was to be an annihilation.

"At an early hour (on the 27th of May) the enemy began his effort to annihilate. Nelson said long ago: 'Only numbers can annihilate'; the enemy had the numbers. He had us penned in within a ditch and the sea; death was round three sides of us and above us: and no doubt death came down upon us. What our men faced in those days is hard to imagine. The enemy had long boasted (and had paid others to boast) of the overwhelming might of his air force. He had the might: no doubt of that: he had the target of his dreams, and the prize of a century. No other place in the war offered such a prize. By putting all his bombers on to the beaches and the harbour entrance all day and all night long for one week of time he might do something which would fill all the headlines of the Press of the world. . . . Now when the enemy bombers came over in their numbers to annihilate the little groups of our fighters took them on. Our fighters were few and could not stay over the beaches for more than fifteen to twenty minutes at a time: in countless cases they returned to England on their last gallon of petrol: but while they were over the beaches each little group would tackle fifty. The usual enemy formation was of ten to twenty bombers, with protecting fighters above them 'arranged in steps,' sometimes fifty strong. . . . Always in those days our fighters were so greatly outnumbered that they were hardly noticed by the men on the beaches whom they helped to save."

And here is a remark of Mr. Masfield's towards the end of his account: "Our Army did not save Belgium; that is a little matter compared with the great matter, that it tried to. In the effort, it lost thirty thousand men, all its transport, all its guns, all its illusions; it never lost its heart." Our Army had experienced the curious change which must come over all armies as the battle is joined and the period of training and equipping, the preparing and the culture of discipline, are put to work. It is a change which Stephen Spender prophetically put more than two years before war broke out when he wrote:

Deep in the winter plain two armies
Dig their machinery to destroy each other.
Men freeze and hunger. No one is given leave
On either side, except the dead and wounded.
These have their leave while new battalions wait
On time at last to bring them violent peace.

All have become so nervous and so cold
That each man hates the cause and distant words
Which brought him here, more terribly than bullets.
Once a boy hummed a popular marching song
Once a novice hand flapped their salute;
The voice was choked, the lifted hand fell
Shot through the wrist by those of his own side.

From their numb harvest all would flee, except
For discipline drilled once in an iron school
Which holds them at the point of a revolver.
Yet when they sleep, the images of home
Ride wishing horses of escape
Which herd the plain in a mass unspoken poem.

In the evacuation of Dunkirk there was something of that feeling as all who watched the faces of the men disembarking and entraining from the south coast will testify. The reaction of the home people was different from that of these men. They returned tired and disillusioned, looked at the people who, beside the railways, waved to them, with glazed eyes which retained an inner vision. They had gone with the "distant words" ringing inspiringly in their ears. They returned from their "numb harvest" with blank faces. It is always so. The men who return from great battles do not live in the same psychological world as those who cheer them and who wave flags at them and entertain them. They have seen fearful things and to them for the time being the cheers and the brass bands and the patriotism are dust and ashes. This same vision could be seen in the faces of the men who took part in the many subsequent raids on occupied France and especially on the occasion of the Dieppe raid of August 1942.

A community is as a steam boiler. When a new means of transport comes, it acts as fresh fuel to stoke up the fire and increase the pressure in the boiler. Aviation came to the world and stoked up the pressure within the communities until it exceeded the strength of the retaining walls so that

they burst. This and not some abstract feeling of patriotism nor some conception of fame and glory drove the world to war. None of this was in the minds of the fighting men. It did not offer to the dumb warriors of earlier ages, when they responded to the biological needs stimulated and activated by the introduction of ships and of roads and railways, a rational understanding and excuse for the deeds they were called upon to do. So although Dunkirk was a revelation, and although it led to understanding of the part to be played in war by air power; it did not provide the fuller and deeper revelation of the causes of war and of how these are also linked up with the coming of the aeroplane. Dunkirk, as other of the crises of the war, must be looked at from different levels if the full interpretation is to be arrived at. On the one level, as an event in the waging of the war, it signified the dawn of understanding in Britain that air must now be taken with sea in the country's major strategy and that the power of the sea alone to protect and to secure as well as to blockade had been weakened by the coming of the aeroplane. On another level it set forth and emphasised the demolition of national barriers such as they had been in the past. It emphasised that men from one country could now fight (or trade with) the men of another country without using the sea way. It emphasised that men from one country could now trade with (or fight) the men of another country without using the land way. It showed the air-welding of the world; it reintroduced to the thinkers of all countries Sir George Cayley's "universal navigable ocean that comes to the threshold of every man's door."

We have to concentrate here upon the lower level of disclosure for the higher level must be left to the time when an attempt is made to interpret the events of 1939 and the years of fighting that followed in terms of world change and world development. At Dunkirk operation "dynamo" was primarily a lifting operation, to be done by sea craft in order to evacuate land forces from territory threatened by the enemy. But it became clear even as the men retreated towards the sea, and as they were slashed at by the German air force; that the lifting could not be entirely a sea-land operation; that no lifting of the kind in the future ever would be a purely sea-land operation—a thing to be later confirmed at Crete and at Salerno. Air power must play its part and its part consisted of protecting the ships and the beaches. Those who looked ahead saw that it might later consist also in doing some of the lifting; but at the time of Dunkirk the idea of using troop transport aircraft and of towing gliders and more especially of picking up gliders from the ground and towing them into the air (a technique developed in America in

1942) was not present. Troop transports had been seen to have value in offensive operations and the parachute troops had also been noted as effective for certain kinds of work—though the tendency remained to belittle their powers. But the greater air-carrying was not yet visualised. There had been no thought of moving armies by air. There had been no thought on the problems of picking up troop-carrying gliders from the ground though there had been thought about putting troop-carrying gliders down on to the ground. But the power of the air was conceived as somewhat one-sided at this period. And it was thought that the task of the air at Dunkirk would be entirely one of protection for ships and land forces during embarkation. It is true that at Calais an attempt was made—and a very courageous attempt it was—to re-victual from the air a beleaguered garrison that had fought nobly. Westland Lysander aircraft were sent over with food and ammunition containers on the racks beside the undercarriage wheels and these were dropped. (See "The Defence of Calais," by Eric Linklater.) This attempt at revictualling a garrison, however, was not a sign of full appreciation of the scope of the air for operations integrated with those of land forces. It was an isolated instance of a form of air activity which had long been developed and had been demonstrated before the war at more than one Royal Air Force Display. But in general Dunkirk elicited few signs that many in Britain realised that air carrying might be employed for a lifting operation or that it might be used for the movements of troops and munitions on a large scale. But there was the understanding that if the ships were to do their work of lifting the troops from the beaches they must have protection from air attack. It was the fuller understanding of the influence of the coming of air transport on traditional Imperial strategy. It was the fuller appreciation that air power must go hand in hand with sea power and that the traditional "moat" protection must be reinforced and completed by air protection.

These wider realisations emerged from the welter of news and the kaleidoscope of incidents, tragic, strange and even humorous. The English character again began to reveal its contradictory elements. Queer underfed little Cockneys displayed a humorous grimness that defeated the hideous mutilations of metal. Flying Officers went cheerfully into battle with inane schoolboy clichés on their lips. The almost inarticulate Englishman, speaking in a few stereotyped phrases, stood up to have his head blown off without the slightest hesitation or qualm. He would damn the running of the war at one moment and give his life the next. Astonishing feats were performed as the troops moved back towards Dunkirk and the sea.

A Squadron Leader was shot down near Calais. Another pilot went in among the high-powered aerial destroyers, the anti-aircraft fire, the screaming machine-guns, in a pedestrian training aeroplane, picked up the other man and flew him back to England. On the way the trainer was attacked by twelve Messerschmitts; but the very absurdity of the whole thing seemed to invest the trainer with remarkable powers of resistance and it reached home safely. On the 22nd of May a single Royal Air Force pilot attacked twenty Heinkels and damaged two. Losses on both sides mounted but the vigour with which the Royal Air Force came again was unabated. On the 24th of May the King broadcast to the Empire and the shadow of Dunkirk was growing darker. It began to be seen that, in spite of heroism and humour, there must be sudden improvement or England would go down. It began to be seen as the May days passed and before the Dunkirk evacuation that the air would have to join with the sea and work with it if the enemy were to be held off. A sense of the urgency of the need for air protection suddenly swept the people. The demand welled up to produce aircraft; to create a powerful air force in a few days. Nothing else would save the country. A miracle was needed and the public turned to a man whom they regarded with mixed feelings, but whose strength of character and vigour in action they knew and appreciated, Lord Beaverbrook. As the troops were forced back to the sea so the people suddenly realised that the sea would not alone prevent the Germans from following them; so they realised that the air bridged the sea and was a universal highway. So an air force must be created to work with the navy to hold off the enemy.

The feat called for was, of course, impossible. No huge air force could be built up in the time, the few days, then available; in the brief intervals between the national understanding of the power of the air and the time when that power would be directed by the enemy against Britain. But if every aircraft could be put in the field, every pilot mounted, every mechanic at work, every factory producing to the ultimate limit of its capacity, there might just be a chance. It was the period of getting ready for the air battle over Britain; it was the period when Lord Beaverbrook was called in to undertake an impossible task—and undertook it and completed it. The question was heard: How many aircraft are we turning out? It swelled daily as Dunkirk flared and smoked to the skies: How many aircraft are we turning out? It marked the understanding of the fearful truth; the appreciation of the power of the air to overstep seas and rivers and mountains; the realisation that British Imperial strategy had been changed by the power of

the aircraft to allow those who had the urge to expand sufficiently strongly developed, to go out over their boundaries even if they did not possess great navies. All these thoughts were behind the question. How many aircraft are we turning out? It was asked with agony and apprehension. And when Lord Beaverbrook became Minister for Aircraft Production the people turned to him and asked him that same question repeatedly and desperately. Lord Beaverbrook took charge of the newly created Ministry, and as the days of Dunkirk glowered so he strove to achieve the impossible. Never had any industry before been subjected to such a forcible impact as the aircraft industry. It did not like it. But it knew even when it objected that Lord Beaverbrook was forcing the pace in a way that it had to be forced if England was to be saved. In brief some dim foreshadowing of the coming Battle of Britain had come to the country and the tragedy of Dunkirk saw an awful agony in the people who watched and waited and wondered. Beaverbrook did not wait. He tore into his task with an energy which justified the belief of the public at large that he was a man of action. He seemed to work perpetually, by day and night. Distinguished members of the aircraft industry were rung up at three in the morning, forced to be perpetually available at all hours of the day and night, driven to drive their workpeople as they had never been driven before, caused to throw everything in for the construction of every possible aeroplane in the shortest possible time. The small, dark man with the wide, curved mouth, forced the pace because it had to be forced. And the workpeople, although they, in common with the executives, did not always like the way they were being forced ahead, knew inwardly that it was that or else defeat, and they turned to and worked. Beaverbrook roared through the industry like a flame, burning out all red tape and entangled procedure; going straight through to the objective; more aeroplanes in less time. He kept in his office a chart and he watched it. Where previously matters were dealt with by formal procedure and the exchange of documents, now there were short sharp telephone calls, orders that had to be obeyed instantly. And the makers knew that Beaverbrook had the mandate of the people to turn out aeroplanes whether the industry was killed in the process or not. They knew that the people knew that it was life or death and that long-term planning did not matter for the moment. For there would be no long term for Britain if the aeroplanes were not available when the next stroke came. So the sixty-one year old, widely disliked, greatly feared, intensely admired, dynamic, restless, driving, ruthless Canadian had his way. The works

turned faster and faster. How many aeroplanes? They turned at racing speed and still he thrust and pushed and drove and kicked. Nobody was free from his influence. Nobody failed to respond to his demands with all they had got directly they saw the central, single purpose of the man. Aluminium was running short. "Saucepans for Spitfires." The Royal Air Force wants saucepans. And the women sent them in to the Ministry of Aircraft Production. From nothing it became the best-known Ministry. It was talked of everywhere. "All employees of aircraft factories," said Lord Beaverbrook in his appeal to the workers directly after he had taken office in May before Dunkirk, "aero-engine works, factories making component parts for aeroplanes, and plants engaged on sub-contracts for the air programme are asked to work by night and by day, full overtime." By night and by day they worked. Lord Beaverbrook's Ministry had an emergency committee which was appointed to deal with the prevailing position of alloy steels. It made other special arrangements for forcing forward production to the absolute limit. Lord Nuffield and Lord Austin, who had done fine work for British aircraft production, had been long regarded by experts of the industry as having done all they could do and as having reached the time when they should leave the active work in aircraft manufacture to others. But neither the industry nor anybody else had had the courage and the power to remove them. Lord Beaverbrook did so. He did so justly, with the fullest appreciation of the fine work they had done, and he did so at once. Lord Austin, retiring from the chairmanship of the Shadow Aero Engine Committee, was succeeded by Mr. W. E. Rootes. So the days passed with the Ministry of Aircraft Production stoking up output. Processes were introduced for swiftly recovering aircraft damaged in action. The "cannibalising" of machines whereby damaged machines would restore themselves to full capacity by eating up other damaged machines, was developed to the fullest extent.

No Minister ever created more controversy than Lord Beaverbrook. No Minister ever annoyed industry to the same extent. He was fearless in the achievement of what he took to be his duty and he rode roughshod over the prejudices and niceties of the aircraft industry. Future histories will attribute to Lord Beaverbrook in large measure the saving of Britain in the critical air battles which were the sequel to Dunkirk. There were many attempts in the years that followed to belittle his achievement. Members of Parliament and industrialists, allowing their jealousy to get the better of their judgment, sought to make it appear that the winning of the Battle of Britain

was the result of long-term planning undertaken before Lord Beaverbrook took office and was entirely unaffected by his activities. That is not true. It is true that the long-term planning played its part. At the time of Lord Londonderry's administration, it had hit upon fighter aircraft of the finest technical quality, the Vickers-Armstrongs Spitfire and the Hawker Hurricane, and upon an engine of equally high merit, the Rolls-Royce Merlin. But although the quality had been determined and defined, the need for quantity was urgent and immediate when Lord Beaverbrook took charge. All who study the facts impartially must know that Lord Beaverbrook did increase output, and increase recovery, with a swiftness which would previously have been considered impossible of attainment. He squeezed out every aeroplane that could be put into action just in time. Nobody else could have done it. History, untrammelled by the petty jealousies and anxieties of the hour, will accord greater credit to Lord Beaverbrook than has yet been given him. And now we come to the time when these two great streams of events converge; when our troops are lifted from the Dunkirk beaches and the air protection is given them, and while at home the factories roar with a newer might to get ready for the greater trial shortly to come. It was to be an air trial, but it was to be amplified and extended by actions in other parts where the emphasis again fell on the co-operation of air with sea. But the course of the war turned mainly on the air battle over Britain. That was where all thought and all critical activity momentarily concentrated. And before we turn to noting some of the inferences that can be drawn from this air battle over Britain, afterwards loosely though conveniently named by the Air Ministry the "Battle of Britain" we must also look forward on a larger magnification.

During the months that are to be scrutinised for the lessons they teach, in the coming pages the student of air power must remark two convergent themes; first the employment of independent air power and second the employment of co-operative air power. At no time in the war is the distinction to be so clearly drawn by events. In one theatre air battles on a gigantic scale are being fought; in another aircraft are co-operating with ships and with land forces. The Battle of Britain cracks the blue skies of England and scratches the enamelled dome; while at Taranto; at Matapan; and then in Crete aircraft rush in to help in the war at sea and the war on land. Britain uses her air force in one place as an independent arm to hold off the aerial assault of the German air force, while in another part she uses it to bring aid to her ships by striking direct at the Italian navy.

Then the Germans turn to using air power to aid their ponderous, powerful armies and to give them a bridge from Greece to Crete where they can continue their conquests. As they occurred these things did not appear to be related. But when they are looked at from the vantage-point of time they are seen to be strikingly inter-illuminating. They show almost at the same moment the power of the air to fight alone and the limitations of the air when it does so; and they show also the power of the air to fight in combination with land and sea forces and the limitations of the air when it does so. The story of the Battle of Britain has been well told by many writers. The book, "Fighter Command," by A. B. Austin (Gollancz) deserves mentioning, and there are numerous other accounts. Mr. David Garnett touches upon the Battle of Britain in his book, "War in the Air" (Chatto & Windus), but this work covers much wider ground and is worth studying for the detail light it throws on the Dunkirk fighting, on the early phase of the air bombing and on the early part of the Mediterranean campaigns. It covers the period from the beginning of the war to May 1941. There is, in addition, the official pamphlet on the Battle of Britain. Besides these there are numerous books of experience by pilots who took part in the fighting. All who wish to obtain a complete picture must also read some of these for their value in casting light on the psychological factor of this period of air fighting and on the attitude of mind of members of the Royal Air Force Fighter Command. "Spitfire Pilot," by D. M. Crook (Faber & Faber), "Tally-ho!" by A. G. Donahue (Macmillan), "I Had a Row with a German" (Macmillan), and the more professional and extremely interesting, "The Last Enemy," by Richard Hillary (Macmillan), are books which appealed to the present author, though there are many other good books of pilots' experience. It is not intended in the pages which follow to go over ground that has already been covered by skilled authors, and it must be assumed that the reader is familiar with the facts of the Battle of Britain. As with other battles, only general references to the actions will be made. For the rest the purpose here is to seek the wider implications and to fit this critical episode into the picture of the developing power of the air. In that respect it stands out as being a test of theory. It translated into fact the imagined events which had been so frequently and so freely put before the public before war broke out. The present author wrote a book called "Acolus or the Future of the Flying Machine," and published it about ten years before war broke out. In it I amplified the predictions as to the nature of the air war that would come which had appeared about 1925 in my

book, "The Strategy and Tactics of Air Fighting" (Longmans), and I cannot refrain from quoting some of what I said because it illustrates how a study of existing development and of the trends of the time enable a picture to be built up which is almost certain to come near the truth. After asserting my belief that the fixed undercarriage then used in all Royal Air Force aircraft would disappear and that the retractable undercarriage would become general I went on to predict the "tank-buster" in these terms: This will be a large multi-engined monoplane carrying a single medium-sized gun and a few rounds of ammunition. It will be able to direct close range gunfire from the air at important ground objectives. The advantage of the aerial big gun over the bomb will be in accuracy. The aerial big gun permits ground objectives and ships to be attacked at short range with projectiles travelling at a high velocity.

In 1942 the Beaufighters and, later, the Hurricane II Ds, were using their cannon for just the purpose I had visualised in 1925; but at the time this prediction was not much noticed. Of the fighting machine of the future I made this prediction: The fighting aeroplane will be a small monoplane without external bracing wires or struts and the undercarriage will be retractable. It will carry one man, and will be an all-metal machine mounting a gas-turbine of some 1,000 h.p. Well the turbine has not yet turned up; but the other details fit the Spitfire exactly. I went on thus: I will give my fighter of this generation 400 miles an hour, 800 miles an hour in the dive, a climb to 20,000 ft. in four minutes and a service ceiling of 60,000 ft. Speed on the level and rate of climb were right; speed in the dive and ceiling were over-estimated. I also predicted a pressure cockpit for the pilot to enable him to work at great heights. I then went on to print some pretended extracts from the newspapers during the war of the future. As nobody else has ever noticed that these might almost have been taken from the actual papers which appeared ten years later in 1940 and 1941 I must minister to my vanity by quoting them myself. :

"The greatest air raid in history was launched on London yesterday evening by a formation estimated at between six and seven hundred aeroplanes. For nearly two hours the earth shook to the thunder of the guns, while far up in the blue vault of heaven there was the flash of wheeling wings as the heroic pilots of the Royal Air Force plunged again and again to the attack. Never before has the heart of the Empire been the objective of so powerful and so determined an offensive, never before have the British air forces so covered themselves with glory.

"Owing to the vigorous defence which met the raiders as they neared London, casualties are low. Official figures have not yet been issued, but it is thought that fewer than 1,000 people were killed while only some 7,000 were wounded."

It is worth noting here that these predicted casualty figures were not far out, nor were the figures for the strengths of the enemy formations. In some of the 1940/41 raids on London the casualty lists included a thousand dead; but the ratio of injured to dead was lower than was expected. The prediction goes on, and it was made long before the word radiolocation had ever been heard and was written in an attempted caricature of journalese.

"The raiders were first reported by the 'concrete ears' or wireless disc and super-sensitive microphone sentries which encircle the coast. . . . The formation—first given as 400 machines, but later corrected to 600—was in four layers and flying at 170 miles an hour. . . . The two big formations were in sight of each other when the enemy was about twenty miles south-west of Chelmsford. Anti-aircraft batteries were blackening the sky with shells. There seemed no hope that London would escape the full force of the attack. Already two ten-ton wireless-controlled flying bombs had struck the city. Even so there was little panic. The gas-mask distribution had worked well and no one was unprovided. The usual shelters were made full use of, but many people, against the orders of the police, remained in the streets anxiously looking skywards and listening to the almost continuous roar of the guns. . . . Quite suddenly the continuous thunder of the anti-aircraft fire ceased. It was succeeded by an uncanny calm, and then by a high-pitched metallic scream which grew in an ear-piercing crescendo. The R.A.F. aerial destroyers were engaging the lower enemy layers. The R.A.F. arrows of the upper air plunged into the heart of the raiders, streaming fire and lead. The hostile formation began to split up, and simultaneously the enemy commander gave by wireless the order to bomb. On the outskirts of London factories and houses were suddenly transformed into pillars of white dust. The shriek and thump of the falling bombs was heard clearly in central London."

And finally, as a convincing mark of the accuracy of this forecast of ten years before the event: "According to official information, damage was small. The raiders had timed their attack so as to escape in the dark. According to figures supplied by the Air Department of the War Ministry (here we look still farther ahead) thirty-seven hostile machines were brought down while only eighteen of our own aerial destroyers were lost. The raid is

regarded by experts as a decisive victory for the British air arm and a complete and convincing justification of the policy of the Air Staff."

My readers will, I hope, forgive me for this self-advertising interpolation. But the prediction was fairly accurate as will be noticed and perhaps that may encourage those who read the later chapters of this book to put more faith in my fresh predictions than was placed in that earlier one. For in aviation the person who lives in it and works in it can foretell the trend of events with some measure of certainty. The only trouble is that those who are in a position to do this do not have the public ear and their predictions are not heard or, being heard, are ignored or ridiculed.

And now we turn from the prediction to the event. The tragedy of Dunkirk was burning itself out, but leaving an acrid atmosphere among the people of Great Britain. They were now quite alone and they had seen during the months of war successive demonstrations of Germany's might. Everything that had occurred showed that Germany was all-powerful. Our own expeditionary force had been driven back to the sea and only rescued by the Navy aided by the air force. It was obvious that the mounting power of Germany was driving towards England. "We are marching against England," they sang. "We are flying against England." Clanking with its armoured machinery, with hosts of aircraft above and hosts of tanks below, blasting its way forward, exterminating every living thing that came in its way, soldier and refugee alike, the German war machine moved towards Britain and was seen by the islanders like a monster approaching with the distorted perspective of a dream monster, moving to them, moving to the narrow sea that separated England from the continent of Europe. The Navy was in that narrow sea. It would fight to the last—that was the feeling and the very fact of the addition of those words "to the last" made it clear that everybody knew that crisis had come and that Britain was menaced more sharply than ever before in history. And although Dunkirk had brought understanding of the power of the air and the need of the air, it was still not appreciated that the main German attack might be by land forces brought by air. The airborne technique had been noticed; but it had not been fully assimilated. The belief was, therefore, that the Germans would attack with air forces only, and in consequence there was the call of aeroplanes and more aeroplanes with the appointment of Lord Beaverbrook to put on the highest possible pressure. The country, blindly groping for defence, had at least correctly summed up the position. It had made a true forecast. The Battle of Britain was to be an air battle.

CHAPTER VII

LOOK back for a moment at what has gone for we come now to an event which takes its place in the history of air war and which will always redound to the credit of the Royal Air Force, the air battle of Britain. The impulsion implicit in aeronautical development had not been seized during the peace. Aviation had been regarded as a thing which must "pay its way" and "fly by itself"; it had been regarded like selling toffee or any other commercial transaction, as a business "proposition" and never as a wider and more fundamental development. War, however, brought the awakening and the operations in France suddenly sent home to every man and woman in England the truth that aviation was more than a business; more than a duty; more than a science; more than an art. They began to see that aviation was a constituent of the fabric of civilisation as it was known and that the future trend of civilisation would be bound up with and conditioned by the future trend of aviation. Transportation is civilisation, said Kipling. Civilisation is aviation, say those who believe in biological growth and in the theory that it applies to countries as it applies to animals. and all kinds of communities of animals, including human communities. For it follows that if the need for the growth of countries exists, aviation provides the means whereby it can be fulfilled. So the awakening of the operations in France had produced far-reaching results. And it had been followed by the understanding that came about at the time of the Dunkirk evacuation.

This structure of understanding had been built up by the events of war. The need for aeroplanes had been enunciated in words of peace, but the words had been disregarded. But when the cry had come from the blood and tears of English soldiers; when it had been realised that air played a part over the sea as well as over the land and that in consequence the United Kingdom could no longer—even if it would—shut itself off from the influence of flying; then there came this dark shadow across the mind; this glimpse of coming events which brought at once anxiety and regret; anxiety as to whether Britain could hold; regret that the scope and power of aviation had not been earlier understood. England's insularity might have been guaranteed in 1940 by a combination of air and sea power, as it had earlier been guaranteed by sea power alone. But the air power did not exist. The

black smoke coiled above Dunkirk in sinister warning. The Royal Air Force had fought well there and given enough protection to the ships and men at the beaches to enable many to be lifted and to allow operation "dynamo" to be recorded as a success. But the Germans were then still grappling with vast military problems. They were not able to concentrate their aerial might entirely on Dunkirk though they did seek to do so. It had been touch and go at Dunkirk. And there all the heavy equipment of the British Army had been lost. A few battered men had come back, but in their hands there was nothing with which to fight. Out of the "jaws of death"—to use the term employed with full justice by Mr. Winston Churchill in the House of Commons on the 4th of June, nearly one thousand ships had taken more than 335,000 men, French and British. But they had done so only because the Royal Air Force had inflicted losses on the enemy at the ratio of at least four to one. But the British Expeditionary Force personnel losses exceeded 30,000 killed, wounded and missing, while the material losses included 1,000 guns and all transport and armoured vehicles. Air had played a part; but it had not been a decisive part. Air had helped sea; but it had not given back to sea its earlier virtue.

Now recall those days between Dunkirk and the fiercest direct assault ever launched on England. Expectation was in the air. There was widespread fear—it would be inaccurate to deny it. A dreadful hollowness was in the souls of the people of the islands. It was a country of the "hollow men." They suddenly saw their own sky changed. They saw it as familiar, when they had thought it foreign. They recognised the cumulus clouds that wandered over the summer sun as old relatives. The enemy roared his threats only twenty miles from England. He assembled the largest military mechanism ever conceived. The people of England looked round in vain for a stout friend standing near to them. For already France was felt to be wavering under the dreadful strain to which she had been subjected. Soviet Russia made no move and only occasionally issued ponderous statements arousing hope one day and dashing it the next until the Soviet appeared as a grim jester, summing up in mock terms, delaying the verdict by first pointing out what favoured one side and then what favoured the other. Only the United States of America was a powerful and a constant friend. Of her no soul in Britain felt the smallest doubt. But the United States were not at war. Nobody in Britain could see the smallest reason why she should go to war though there was always a feeling that she would go to war before the end. But it was not for a moment thought

that abstract friendship for Britain would bring her in at that tense moment.

So Britain, as the Prime Minister said, stood alone. The enemy, flushed with unheard of victories, had already hurled the British expeditionary force into the sea and seized all its equipment—all its laboriously made, collected and transported guns and vehicles and supplies. The enemy had received no check except for a partial delay in the air during the Dunkirk evacuation; but nothing else. So now the Germans paused as if smacking their lips in pleasurable expectation of eating the last and finest dish. It was clear to all that if Britain fell now no other country could stand. Even the friends of Britain in America, seeing the facts as they were, gave up hope. Their remarks in the American newspapers came back to England and increased that hollowness of soul for the hollow men. It was crisis. In the situation then was the tragedy and the fear of the animal hunted down and now at last facing the huntsman—facing the huntsman knowing that his teeth are his only defence against the huntsman's spear and pack of hounds. But there was also something else animal. Welling up in the vulgar soul of Britain was the last call and the final resolution. Death was on the way. But there would be no asking for quarter. Death moved slowly towards the cowering Britain—cowering but vicious. The vulgar spirit was roused but not at all in the way that has been superficially described—not with heroic determination to win through; but with bitter, animal fear and instinctive need to bite back even as the spear went home. There was little, as I felt it and with respect to keener analysts, of the abstract, spiritual great in Britain's feelings and reactions; but much of the animal and natural. Britain now cowered for the final stroke. She had got back her men. Her air force had fought to get them back but was hurt and all knew it was hurt. Let this be noted well, that the Royal Air Force did not go into the air battle for Britain fresh and undamaged. It had fought furiously at Dunkirk and there was not really any interval for rest and recuperation. The Germans rushed on; they tore through their arrangements so as to strike before there was a chance of recovery. They wound up their gigantic war machine as rapidly as possible. Britain saw the winding. She heard the rattle of the ratchet. As she cowered in the island she saw the preparations. The 10th of June—only a week after the last ship had left Dunkirk with its tragic testimony to military defeat—and Signor Mussolini announced that Italy declared war on Great Britain and France. The wounded animal saw the huntsman joined by another who proposed to

participate in the kill. And the other huntsman had not even taken part in the chase and was fresh. On that same day the Admiralty announced the loss of the Aircraft Carrier *Glorious* off Norway. Misfortune piled up upon itself. Yet still the Royal Air Force worked in France, bombing the enemy's rear, performing as many reconnaissance functions and fighting functions as it could. It did not give up there. It still helped within the limits of its power, the retreating French. It did not return to the small threatened island and desert the Ally which had been such a good Ally in 1914-18. It did not—even at this desperate moment—forget. And on the 12th of June the Royal Air Force bombed Turin; shadow—though uninterpreted—of distant events. It was not giving up; it was not showing signs of moral collapse. It was fighting hard. Its wounds were not reducing the fire of its assault. On the 14th of June the enemy's communications from Rouen to the Maginot Line were bombed. The Ruhr, Duren and Essen were bombed on the next night. But although the Royal Air Force fought on, crash followed crash in the allied effort. Marshal Pétain succeeded the compact, noble, well-tempered M. Reynaud as French Prime Minister and the very next day he shocked all who knew him as the inflexible victor of Verdun, by ordering the French Army to cease fire. Mr. Winston Churchill's inspired last moment offer to France of full British citizenship and the making of the two countries one, was rejected by the French. Some canker was at work. The Germans began their armed reconnaissance flights against England, dropping bombs in many parts. The neat and smiling fields of Surrey felt the first bombs in the London Area on the day after France capitulated. Major-General Coeler was stated by the German radio to be in control of the air squadrons making these raids. On the 19th of June, and following nights, the Royal Air Force raided the Ruhr. On the 24th of June Herr Hitler declared that the war in the west was ended. His words seemed almost true. For apart from her navy and air force England was defenceless and the air force, though bold, was not strong. England had not—as it seemed then—the combined air and sea strength to hold off invasion. Her forces were virtually unarmed and had just been badly mauled in France. England had no allies close to her. To the Germans the war in the west appeared to have concluded satisfactorily and according to plan. The operations against England could be not much more than mopping-up operations for the power of resistance did not seem any longer to exist. Events were crowding in a massive array against Britain. Every day, almost every hour, some fresh

piece of bad news came to hammer at the bruised people, and to lacerate their spirit. No position more frightful has been held by any country in history. Its close ally collapsed and ready—as it seemed—to hand over its fleet to Germany and so at a stroke set the balance of sea power against the island nation; the enemy with a fresh ally just joined him; Britain's army disarmed and wounded; her air force fighting strongly but already damaged and appearing to the eyes of those who weighed the situation during those tense hours a puny and indeed insignificant mite to set against German might. So the days passed, bad news piling up, Britain bleeding and at bay; fed only with difficulty and by the heroic deeds of the Royal Navy and the Merchant Navy; unarmed; stupefied by a succession of blows. In a month, from mid-June to mid-July the enemy raided south-east England twenty-two times; East Anglia fifteen times; the north-east of England twenty times; the Midlands seven times; the south-west seventeen times; and the south fourteen times, besides a few raids on Scotland and Wales. It was the preparatory work for what was to come; the "armed reconnaissance" in preparation for the final strokes for rounding off the war in the west; the softening process. The Germans saw Britain reel under the successive blows; Dunkirk, Italy, France. But still they wanted to make sure, and so the anaesthetic was to be administered even more copiously before the German soldiers moved in. Every possible step was to be taken to ensure that they could move in to a deadened, dulled, enfeebled country. We have heard of the heroism of Britain. But those who were there know that the tension was uncalculated; not—in the literary sense—noble and heroic. Perhaps it was because Britain was not so civilised as France that the dull unthinking wish to resist came to the surface; that the thoughts of every man and woman and child—as the hour of final trial approached—turned to nothing but resistance and the reaction of trying to hurt those who were hurting.

A macabre comedy was played now in public house and club; a comedy fantastic and improbable, yet true. The people of Britain forgot their science and their mathematics; they set aside their reason and their logic if they ever had any. They did not weigh military possibilities. If they had they would have laid down and sought merely to placate the new master as the domestic animal might. But they still retained enough of the wild within them. So there came that astonishing period during which the conversation in club and pub., turned on one subject; how to improvise weapons with which to wound and kill Germans. It appears ludicrous now in the highest degree; but to every Briton it was serious then. The

question of how to sharpen a dinner knife so as to stab home; the matter of using shot-guns with lethal effect; the composition of home-made bombs and grenades; the employment of traps and devices of the horriest kind: these were the matters discussed. The question of what was going to happen was not mentioned or even thought of, for every man and woman knew what was going to happen if the Germans sought to set foot on the shores of England. The Germans would be killed. If it had to be done with sharpened dinner knives, or sawn-off shot-guns, or pitchforks or garden forks, it was going to be the one aim and object of every citizen, great and small. And Winston Churchill now expressed the thought and desire of every Briton. He spoke, and every living soul in Britain felt his own will and thought throbbing in those noble words. The very tone and delivery of the Prime Minister was sympathetic to every Englishman; his expressed sentiments were shared by all. The "greatest hour" found the greatest man; a man greater in stature, because his hour was greater, though similar in kind to the greatest of the Elizabethans. So now there was this ludicrous sharpening of table knives; this fantastic sawing-off of shot-guns; this incredible arming with pitchforks so that the invader would have had a nation against him and no second of his life would have been secure if he had managed to gain a footing. It was a spirit of desperation and it may be supposed that the Germans noticed it and, with their usual psychological insight, decided that the softening process would have to be carried rather farther than it had been before the invasion could be attempted with any certainty of success. Even the most hardened soldier dislikes entering a city where he knows that the hatred of him is so fierce that the children will seek his life. The subsequent step, therefore, was inevitable. The British Isles must have further preparation. Like the surgeon's patient who must be thoroughly anaesthetised, but in gradual stages, the British people were to be bludgeoned into semi-insensibility so that their hatred would be stilled and so that their plans for resistance would fade. But the British Navy was still strong and so inevitably the next stage of war was an air stage. It was in June 1940 that the Germans began the large-scale bombing of Britain.

June 1940 was therefore the opening of full air war on the United Kingdom although the German air effort did not build up to full intensity until the moment already alluded to which came three months later. In July the Ministry of Home Security issued the first of the new monthly statements of air-raid casualties. It showed that for the month beginning

the 18th of June 336 civilians were killed and 476 were seriously injured in air raids on Britain. The largest number killed in any one locality on one occasion was given as thirty-two. Meanwhile the Royal Air Force and the anti-aircraft defences had brought down at least 146 enemy aeroplanes.

It was towards the end of this month of raiding that the Royal Air Force made its historical bombing attack on the Dortmund-Ems canal. The raid was made in bright moonlight and bombs fell on the aqueduct, the safety gates and the embankment. A Sunderland flying boat sunk a German submarine in the South Atlantic and there were raids on Africa. Against the larger canvas of the war these were small things; but they did show that the spirit of Britain was desperate and that its air force, though woefully small, was filled with the fighting spirit that it was to show in full measure in a few weeks' time. They ought, these things, to have been a warning to the enemy. But—perhaps fortunately for Britain as it turned out—they were not heeded and the impression was held by the German High Command that although Britain was not yet ripe for invasion it could be battered into softness by the full employment of the German air force in really powerful raids. The plan was to maintain and slightly to increase the raids on shipping so as to add to the effects produced by submarines and to prepare for the master-stroke at the British Isles.

It must be conceded that the Germans still saw more clearly than other countries and certainly more clearly than the people of Britain the power of the air. They saw what advantages could be gained from employing its power to overstep sea and to fly over land with equal readiness; they realised that it gave them the power to reach out beyond their frontiers and out beyond the frontiers of the countries they had overrun, and in some measure to come to grips with their main enemy and make all ready for the victorious final moves of the German army. The Germans saw something of the inner meaning of air; Britain still saw little. But the realisation of the military meaning of air was now being borne in upon the people of Britain by military events. The discipline of consequences was having its effect. So now, holding their pitchforks and their sharpened dinner knives, the people of Britain still realised that the Germans might come at them from above where their improvised weapons would be unable to make any counter-stroke; they realised that the development of aviation made it possible for the enemy to strike at them without their being able to strike back. And so it came about. The animal instinct to fight for life was to be allowed to expend itself in inactivity while the animal was further pounded from a safe

distance. The huntsman saw that the animal was hit, and bleeding and exhausted; but he still thought it likely that it would be able to bite again and he decided to keep at a distance and employ the methods science had given him to ensure that before he advanced further all power of resistance had been struck from the creature. Britain did not know how the stroke would be made. If the Germans came by sea the Navy would tackle them and those who arrived would be despatched with table knives and pitchforks. But what of the parachutists?

Parachutists had been used during the invasions of Norway and the Netherlands and one of the methods the Germans might employ was to drop parachutists on England in order to prepare the way for their other forces. The parachutists was really a development of the special mission man of the war of 1914-18. In November, 1914, French General Headquarters called for a pilot to drop an agent behind the German lines and Lieutenant Pinsard volunteered and returned safely after performing this duty. Subsequently many other similar landings were made by British and French pilots, but so far as can be ascertained the first parachute landing took place on the Italian front where an agent named Alessandro Tandura was dropped behind the Austrian lines on a moonless night. In Russia during the war of 1914-18 the Germans employed the method and although the Germans have disputed this, it does seem to be established that the Russians were the first to possess fully constituted parachute troops. Marshal Tuchachevsky believed that parachutists would be of value for infiltration tactics and later the idea was fully developed so that at the time Britain stood ready to take the shock of the great German air assault in September, 1940, Russia was believed to have nearly 500,000 parachute troops. The Germans had originally developed parachute troops on the Russian model, but they had been extremely secretive about it and had managed to prevent the strength of this arm becoming known to any of the Allies before the outbreak of war. But now it was recognised that parachute troops might complicate the situation when the Germans tried to seize England. But even here the citizens were ready for them; here, they thought, might be the chance for the pitchforks and sharpened dinner knives, and in the mildest mannered of them there welled up a hatred so that there was at one time almost a *hope* that the Germans would try to land. The enemy did not fulfil that hope. They did not allow the murderous intents of the mildest mannered Briton to be given vent. They at once deprived them of the opportunity to kill Germans with dinner knives and at the same time they put the citizenry

to a further trial—to trial by air which exceeded all earlier trials by fire and sword.

In July and August the German raids mounted in volume and assurance. Mainly they were directed at the south east corner, where fifty raids were made within a month from mid-July to mid-August while twenty-seven were made on the south-west corner and twelve only on the south, figures which should be compared with these given above for the previous month. The German raiders were concentrating more and more; and hammering more and more fiercely at places such as Dover. It seemed that the pattern of the coming assault was beginning to be revealed—the pattern of overwhelming air bombardment on the south-east corner, especially on port regions such as Dover prior to the landings there and elsewhere. But this pattern was never to be achieved. On what date did the air battle of Britain—I shall call it "*the* Battle of Britain"—begin? The official view is that it began on the 8th of August. And there had been just before this date a slight lull in enemy activity with a notable reduction in the numbers of attacks on British shipping—a sign that the Germans were gathering their air forces together for the supreme effort. But German attacks had been going on ever since the Dunkirk evacuation and great demands had been made upon Fighter Command of the Royal Air Force. It is, therefore, as has been said, an error to think that Fighter Command had been inactive before the air battle of Britain and had been able to prepare itself without interruption for that event. It had been continuously in action and it had suffered losses at enemy hands. But the 8th of August was the day of the first mass raid; the day when the great and ultimate trial of strength between German and British aviation began.

Look first at the opposing forces which were now to clash in heart-stopping conflict; which were to engage in the first aerial struggle between two first-class powers. The Luftwaffe was a well-balanced, powerful force. It was organisationally a separate force, yet, as has been explained, operationally it was much more closely tied to the German Army than the Royal Air Force was tied to the British Army. Indeed there was only the loosest connection between Britain's land and air forces and between her sea and air forces, and this looseness was to have its effects later. At this critical moment in English history what was eventually to be looked on as a mistake, became—temporarily—an advantage. For the enemy failed to give full weight to the fact that the Royal Air Force, in response to Marshal of the Royal Air Force Lord Trenchard's powerful and sincere—but as some thought

mistaken—views, had been built up primarily as an independent arm. It had been built up with a view to an independent air war and it had given only small consideration to sea and land demands. The German air force was superlatively well trained for collaboration with the German Army. In this it had developed what almost amounted to a new technique. It had developed the dive-bomber more than any other air force, and these machines were able to perform remarkable feats of accurate and effective bombing as some places in England were soon to know. But although the Luftwaffe had concentrated first on close support work for the German army, it had also built up a big strategical bombing force. And this force was manned by skilful and determined men who had been well trained and who were equipped with excellent aircraft of high performance and possessing many features of advanced technical quality.

The German air force assaulted Britain with a large variety of types of aircraft and at one moment, towards the end, it brought in—because it was feeling its losses—some Italian machines. These Italian aircraft were of poor quality and soon proved unable to stand the strain of combat with the skilful and high performing British fighters. In the main, therefore, the air battle of Britain was fought by the Germans with Messerschmitt 109E single-seat, single-engined fighters, Messerschmitt 110 twin-engined single or two-seat (both arrangements were possible) fighters, and Heinkel 112 and 113 single-engined, single-seat fighters. The German bombers included the famous Heinkel 111, which was the first type to be shot down on English soil, and the Dornier 17. The Junkers 88 came into the picture later on, but the Junkers 87 dive-bomber played some part in the air battle of Britain. The German bombs were of various sizes and were generally stowed vertically (an arrangement not adhered to) being hung by a lug on the nose in a vertical position in the aircraft's bomb rack. This form of stowage increases the trail distance compared with the horizontal stowage adopted in British bombers and it may therefore produce a slight diminution in accuracy, though whether of measurable amount I do not know. The favourite German bombs of 100 kilogrammes, 250 kgs. and 500 kgs. But 1,000 kilogramme bombs were used—or bombs weighing about a ton—and, later, even larger bombs than this though during the air battle of Britain no bomb is recorded as having been dropped by the Germans of the weight of the bombs used by the Royal Air Force in 1942. In that year Bomber Command used 4,000 lb. bombs a good deal and began to use 8,000 lb. bombs. With the high explosive bombs the Germans used a

variety of incendiary bombs, the most popular one being the small kilogramme, magnesium incendiary, with or without explosive capsule. A large oil bomb was also used especially in the London area, and so was a form of "Molotov breadbasket" which was a multiple incendiary bomb, the incendiaries being dropped within a form of canister which helped to scatter them as they fell. Phosphorus bombs were not used until later.

The British fighters, with which the work of resisting the German attack was done, were of two kinds only, the Vickers-Armstrongs Spitfire with Rolls-Royce Merlin engine, and the Hawker Hurricane also with Rolls-Royce Merlin engine. Both types in their early form used two-bladed, fixed pitch airscrews and mounted eight machine-guns of the .303 size all buried in the wings. Performance figures for these British fighters varied according to the mark in use; but the published Martlesham figures given just before war broke out credited the Spitfire with a top speed at best altitude of 367 miles an hour and the Hurricane 335. Four men's names deserve to be remembered as being the creators of these aircraft: R. J. Mitchell, designer of the Spitfire, Sydney Camm, designer of the Hawker Hurricane, and Sir Henry Royce and Mr. Ernest Hives who, although they were not in the strict sense the designers of the Rolls-Royce Merlin engine, were the moving spirits behind the whole of Rolls-Royce methods and aims and ideals and who also maintained a guiding influence on the activities of the company. Mitchell, whose work was recognised though in a manner not fully adequate in a film which was shown in 1942, was a strange, quiet, competent man. Square built, but rather small, with fairish hair, he was the mildest of men; yet he had, when it came to the point, a great fund of resolution. And it must be held to be this resolution that enabled him to put through the pluperfect design of the Spitfire against all opposition. He did it in face of subsequent Service desires for that kind of modification which is also spoliation, and in face of the more rational demands of the production engineers who were disturbed at the thought of having to try and put the Spitfire into really large-scale production. Mitchell knew by some instinct that the artist in him must be permitted to rule, and he insisted on preserving the fine lines of the Spitfire against prayers, entreaties and threats. The Hurricane is a great and a historic aeroplane, which did, perhaps, more than half the work, measured in sorties, in winning the air battle over Britain in 1940; but it would have been powerless had it not been partnered by the Spitfire. For it was the superlative quality of the Spitfire as a flying machine that enabled it to provide the top cover which—though

it comes at the top, is in fact the foundation of aerial fighter tactics. The Spitfire took the top cover jobs; it tackled the high-flying enemy aircraft; it went for the fleetier, faster-climbing German machines. And it could always outfly them and so, in the end, outfight them. It must not be taken to be a slight upon the Hurricane when it is said that it was secondary to the Spitfire. Perhaps absolute justice demands that it should rather be said that it was only the partnership of the two aircraft that brought victory. But absolute justice also demands that the concensus of fighter pilot opinion be also stated and this was that the Spitfire was the better high-level aircraft and that, had it not been for the Spitfire, the Hurricane might have proved unable on its own to win the air battle of Britain. Top cover is always the crux in air battle. The Spitfire provided it. And so in those days of air battle, when the skies suddenly screamed with the sound of fast-diving machines, the name of Mitchell was written among the clouds. He had created a masterpiece among aircraft and he had done even more; he had defended it as a masterpiece against all the influences of reaction and spoliation that inevitably surround and seek to diminish masterpieces. "There must be a beginning to every great matter," said Sir Francis Drake in that famous passage, "but the continuing until it be thoroughly finished yields the true glory." Mitchell began a great matter; he continued it until it was thoroughly finished and then—before he saw his work acclaimed or even recognised at its true worth—he died.

One more point must be made about the aircraft with which the Royal Air Force fought the air battle of Britain before we seek momentarily to recapture the hurry and rush of those fateful hours. The Spitfire, giver of top cover and therefore of life to the other defenders of Britain, was the child of Mitchell's brain; but he had prepared himself for its creation through the agency of the Schneider Trophy races. He and Folland—who designed the fighter aircraft which in 1914-18 played a tactical part almost exactly parallel to that of the Spitfire in 1940—had both been designing high-speed aircraft for the Schneider Trophy races. They had both produced beautiful and efficient machines; they had both shown the same artistic talent in their designs. And Folland's Gloster Gladiators had proved their quality in the early stages of the war as Mitchell's Spitfires later. And it is worth noting—though it carries us beyond the period at present under review—that the de Havilland Mosquito bomber which was later to achieve such remarkable feats mainly through its fine performance, also owed something to air racing. For the de Havilland Comet which, in the hands of

Scott and Black, won the MacRobertson Trophy air race from England to Australia in 1934, did provide Captain de Havilland and his design staff with a design exercise which coloured their subsequent work and enabled them to produce the Mosquito. So the sporting activities of British aviation were not without their value when war came. They had taken the place—to some extent—of the Government support which had been lacking and had enabled aircraft design development to go forward under adequate stimulus. These races were frowned on by the governments of the period and indeed—as is well known—it was only the personal and private generosity and patriotism of that odd woman, Lady Houston, that enabled Mitchell to proceed with his designs of a racing seaplane for the final Schneider Trophy contest. Nevertheless those who seek for first causes and who try to find out what gives strength, must note the significant links between racing and first-class, high-speed aircraft design.

We have now the picture of the German aircraft and of the British; the two competitors have been introduced with appropriate gestures. They are lined up; the huge, towering German air force with its enormous strength, its bulging muscles, its determination and its courage; and—on my right—the wretchedly small, yet remarkably fit and quick Royal Air Force. The big man against the little man; the great, slow-moving hulk—with death in every blow—and the swift-dodging, agile little man, quick-thinking and no less fit. It is David and Goliath, the story of unevenly matched contestants that has thrilled the peoples of all generations through the ages and that will thrill other generations to come; the basis of who knows what deep psychological conflicts and instinctive desires. On my left the German air force; on my right the Royal Air Force. The betting leaves little doubt about the spectators' views. They would like the little man to win; their hearts go out to him; but when it is a question of sober judgment, they say that he has not got an earthly chance. Their money is on the big man; the big man who has never lost a battle yet. Soviet Russia seemed to think that the chances of a British victory were small. The United States thought that the chances of a British victory were small. The course of events was predicted by experts in every corner of the globe. The British air defences would be shut down by attacks of unexampled ferocity until the Royal Navy alone barred the way to the invader. When the air defences were gone, the Royal Navy could be dealt with by air power. Air power could tackle it, cripple it and, at the same time, overstep it and wreck its ports and harbours and installations with bombardment and parachutists. That was

the theory. That was the firm expectation of friend and foe. That was—to speak clearly—the probability as the people of Britain themselves saw it. But there was the absurd sporting ideal of “putting up a show” and playing for the sake of the game and playing with heart and soul. The sharpened dinner knife complex, ludicrous yet desperate, would keep reappearing.

The seconds were not to be overlooked. General Field Marshal Göring, German production chief, was driving his German production machine at breakneck speed to feed his air force, for he knew well that victory would not be achieved without losses. He was determined to pour in the fresh machines at such a rate that the flow of aircraft would at no time restrict the efforts of the German air force. The second, in the other corner, was Lord Beaverbrook, rallying the producers of Britain. He was as determined as his opposite that the Royal Air Force would never falter through lack of machines. By fair means or foul—by both when necessary—the air force was going to get the fighters. It did get the fighters—we have the express word of Air Chief Marshal Dowding for it. We have the result as final proof.

Air Chief Marshal Dowding—he now enters upon the scene—thin, worried-looking, pale, with a small, straggling moustache; Air Chief Marshal Sir Hugh Dowding, mild-spoken, fidgety, unimpressive, Air Officer, Commanding-in-Chief, Fighter Command. He had made ready to the best of his ability. During peace-time when he had been starved of men and money he was in charge of Fighter Command—after holding many other posts, one of which had enabled him to exert a noticeable influence upon fighter design—and he had done what he could to prepare against the day he saw would come, the day which now had come. Air force against air force; a grapple in the skies which would determine—perhaps on its own—the fate of Britain. Strangest figure in all this strange drama was undoubtedly Air Chief Marshal Dowding. No sooner had he won the air battle of Britain than he was placed on the retired list. He was not understood and he was appreciated by only a few. Among his own officers the views about him varied and there were some who refused to admit his ability. Again, however, the outcome of battle was the proof. How strange that this man who saved England as much as Nelson saved her, should have been, instead of commemorated in a monument, allowed to retire from active service in the Royal Air Force immediately afterwards! Never in history has a commander won so signal and so vital a victory and been so little thanked by his country and even by his own Service, for even

the barony was belated. It is astonishing that this commander who won the battle of Britain should have been little known to the public before the battle, and not much better known after. Those who seek to belittle him have done their best. But the facts stand. They are that Air Chief Marshal Dowding was in command of Fighter Command not only during the battle itself (when the belittlers could have said that he was enjoying the fruits of someone else's good work) but also during the whole of the immediate period of preparation. When the aircraft with which the battle was won were in their early stages of development, Air Chief Marshal Dowding was in charge of Royal Air Force research and development. It may be argued that battles are never won by individuals. But that view has never gained support. When General Wavell won his victory in Libya there was no concerted attempt to take the credit away from him. When Field Marshal Rommel later won his victory there was—in Britain—something which approached eagerness to see that he had the fullest personal credit. But Air Chief Marshal Dowding was subjected to belittlement and even misrepresentation. His son took part in the air battles and he afterwards said—in a halting but curiously impressive speech at a gathering intended to commemorate the victory—that he regarded all the fighter pilots he commanded in the same light—as if they had been his sons. He did fight with them. He planned their work and gave their heroism its opportunity. He perfected the system whereby Sir Robert Watson-Watt's great invention of radiolocation could be best used; the web of operations rooms and the like which allowed enemy movements to be reported and appropriate fighter forces to be assembled upon the invading formation.

On my left, then, the German air force with its second Göring in the corner; fat but energetic and determined to drive through to success; on my right the Royal Air Force with its second Beaverbrook. The gong sounds and the massive, muscular German air force rushes in, bellowing like a bull, to smash the small Royal Air Force with a few furious, whirling blows. A vast formation of aircraft has rendezvous over conquered France and turns towards the cliffs of Dover. Its engines fill the heavens with their sound. The sky is speckled with aircraft as far as the eye can see. It carries a tremendous load of bombs. It is going to strike hard.

In the operations rooms of Fighter Command the approach of this great formation is noted by the controllers. Each group of hostile aircraft is followed as it moves towards England; its size noted, its course plotted; its objective judged. The calls go out to the fighter squadrons which are at

"readiness," the pilots wearing their flying kit, the aircraft with engines kept warmed. The whole system, from radiolocator posts to operations rooms; from the controllers in the operations rooms to the squadron loud speaker systems, is put in motion. The whole of a great and complex organisation is now to be tried for the first time. Many novel ideas and novel inventions are being tried for the first time too. The aircraft themselves, though they have had a preliminary trial, are to receive their first full test of major air battle. At the order to scramble the pilots run to their aircraft and are soon formed up in the air, squadrons sometimes flying as eleven machines, with two sections of four each and one of three, sometimes in other arrangements. In the air they are still linked to the great system. The controllers speak to the leaders of the formations as they climb; they give the height of the enemy and the course the formation must adopt to find him. This method of leading or directing the defending squadron to the enemy as the result of a series of ground observations and ground appreciations of the position, was entirely new and it transformed the whole picture of air defence. For in the past the chief problem of the defending aircraft was to find the enemy when once it was in the air. The pilot of an aircraft is bereft of one of his senses in so far as the detection of other aircraft is concerned—the sense of hearing. He cannot hear the engine of the enemy, only his own engine. Moreover, by the fact of his elevation he has a greater region to search. He must look around a whole sphere in his attempt to spot the enemy, whereas the ground watcher—aided by his sense of hearing—has but a hemisphere to search. There is the added difficulty provided by the regions of sky blanked out of sight by the parts of the aircraft. The defending pilot cannot look all round without tilting his aircraft this way and that because such parts as the wings get in the way. So the introduction in the air battle of Britain of full control of defending aircraft from ground operations rooms, where the movements of the enemy aircraft could be reported and plotted was new and made this battle not only heroic but also technically historic. There had never before been anything like it. Before the war the saying had been coined that civil aviation flies on the ground; meaning that it derives its trustworthiness and punctuality from the ground organisation rather than from expert handling in the air. In much the same way it might be said that the air battle of Britain was won on the ground. The controllers in their protected operations rooms, with their staffs of telephonists and plotters; the radiolocation and Royal Observer Corps men, the members of the Women's Auxiliary Air Force—these were in some sense the winners of the battle of Britain.

They moved their pieces through space in the new three-dimensional warfare and assembled the right forces on the enemy formations at the right times. Sir Hugh Dowding had conceived and perfected the finest air defence system the world had seen. It was far in advance of the limits guessed by many competent air officers. It was a remarkable and for ever noteworthy achievement. The air battle of Britain of 1940 was, in this sense, won on the ground. Yet if the pilots had been less well trained, if they had been less courageous, or less fit, all the complex ground organisation, all the wonderful engineering which went into the Spitfire and Hurricane and into the Merlin engine would have been thrown away. For an air defence chain is as weak as its weakest link and had the pilots failed in any measure all would have failed.

The pilots did not fail. In the books I have mentioned they have recorded some of their impressions of the fighting of that period. They are often simple impressions; but they reveal the sturdy spirit that inspired the pilots. Among themselves they did not—as so many seem to think—talk in heroics. They did not express anxiety to get at the enemy on every occasion. They behaved as many good soldiers have often, if not always, behaved in the past; expressing a grim, half humorous dislike of going into battle, but going in nevertheless with fortitude and determination. The best comment on the part played by the pilots was made to me not long after the battle by a great civilian test pilot, a man with thousands of hours flying in his log book, knowing the air and the problems of flight intimately, knowing the men who flew intimately. His test flying was interrupted as the enemy aircraft came over to bomb the aircraft works nearby and he made it his habit to lie on the ground with binoculars and to watch the course of the battles. He saw a great many fights—as did many others. I myself saw three or four, one of them over greater London. But where he gained in the wholeness of his view was that he watched air fighting right through the battle until the Germans gave up; he saw the first great German formations coming over full of confidence, flying beautifully and maintaining formation in a manner that evoked admiration for their flying discipline. He saw the Spitfires and the Hurricanes go into these formations and break them up; he saw the later formations which came over with the enemy pilots rather less confident and with their flying discipline rather less good though still not bad. He was able, therefore, to obtain a balanced picture covering the gradual unfolding of the events of the battle. And among his most vivid impressions were first, the aircraft he first saw shot down in flames—they were as it happened all

British machines, although the totals showed that more enemy machines were shot down than British on these occasions—and, second, the manner in which the Royal Air Force pilots attacked. At the beginning he expected them to go in with a will, and they did. But as the battle wore on and the German attacks seemed, if anything, to grow in volume and intensity, it appeared that our fighter defences were being very hard tried. It appeared that Fighter Command was working up to and beyond the limits of its powers and that it must be getting tired. It was therefore with the greater admiration and respect that he saw the fighter pilots of the latter stage of the battle, right up to the last big fight that he witnessed, going into the fray with even greater abandon and more determined fury—he avers—than at the start. That is a tribute to the pilots of more worth than those which simply regard them as heroes by definition. This experienced pilot felt as he watched the fights that they were getting tired, as all fighting men must as the enemy turned on ever-increasing pressure. But he saw their spirit riding above fatigue and enabling them to force their aircraft into battle with a show of all-conquering resolution even when their private and inward thoughts must have contained some fearful doubts.

The air battle of Britain; will it retain its glory? No prediction on that can be made at the time these words are penned. For aviation mounts and soars to ever greater scope and power. The “few” apostrophised so grandly by Mr. Winston Churchill in his words which went round the world:—“The gratitude of every home in our island, in our Empire, and indeed throughout the world, except in the abodes of the guilty, goes out to the British airmen, who undaunted by odds, unwearied in their constant challenge and mortal danger, are turning the tide of world war by their prowess and by their devotion. Never in the field of human conflict was so much owed by so many to so few”—these “few,” were they to be outdone by a future “many,” a many who would fight as truly and as well in yet vaster battles in the sky? That is the question. The answer must be that greater air battles will be fought, if not by the time these words appear than at some future date, but that the “few” will rest in history because they were undertaking a new thing in war. They were fighting the first all-air battle. They were defending England against the first all-aerial attack, they were employing a new mode and method of war, perfected in theory in peace, but not until then ever tried in practice in war.

English skies were scratched day after day by the condensation trails of the aircraft as they grappled for life in the blue. Those long white, curling

trails told of death and glory. The farmer looked up from his field at them and his thoughts turned to a vague mental picture of a composite fighter pilot, a being compounded of pictures of leather-coated and goggled men in the daily papers and of stories and rumours. The townsman looked up and for him too there was a picture of the fighter pilot. The few were making their canopy in the skies and imprinting their portrait on the minds of an island people who had always thought first of the seaman as being their protector. During those days of sky-struggle a new thought was growing in the minds of the people of Britain. It was the thought that the invention of a mechanism which allowed people and things to be carried in the "universal navigable ocean" had altered their defences, their own way of life, the cohesion of their Commonwealth and the very core of their existence. They formed, therefore, their own picture of the pilots who formed the "few." They knew less of Sir Hugh Dowding, who corresponded to the great generals of the bygone ages. The names of Air Vice-Marshal Park, of No. 11 Group of Fighter Command of the Royal Air Force, of Sir Quintin Brand and of Air Vice-Marshal Leigh-Mallory of numbers 10 and 12 Groups, were almost entirely unknown to them. But the picture of the defending air force created itself with the portraits of the composite air pilot who was doing the fighting.

It was, therefore, a justification of the independent air force. It was air war apparently unconnected with either land or sea war. It was a parallel to air speed in that it was related to air only and not directly referable to land events. It upset the theories of those who called for a "balanced" force of all the arms, for the "integration" of air power and land power and sea power. It challenged the sea-power sentiments on which Britons had been born and bred. It made it seem doubtful if there was indeed much value in developing aircraft like dive-bombers, or torpedo carriers, or any type designed primarily for close support work with land or sea forces. It made it seem doubtful if any types were wanted among the primary air forces other than the fighters and the heavy bombers. The need even for the small high-speed bomber appeared to dwindle; for this appeared, at this instant, to be pre-eminently a close co-operation type not very well suited to the all-out, all-air war. The air battle of Britain made opinion in Britain and elsewhere lean towards the independent air force. It gave impetus to the arguments of those who were calling for its establishment in America, where the United States Army and Navy retained their own air forces as in the early organisation of Great Britain at the time when there existed the Royal

Flying Corps and the Royal Navy Air Service. Britain had entered World War II with a separate air force—which did not at the beginning even have an Army Co-operation Command though one was soon afterwards created—but with the Fleet Air Arm entirely under Admiralty jurisdiction. Afterwards changes were to occur, the Army Co-operation Command was to come more and more under Army influence until it was finally merged in the Tactical Air Force; the Fleet Air Arm was to grow in size and the Coastal Command of the Royal Air Force was to come more and more under Admiralty influence. Meanwhile the Army itself was to begin forming a large force of airborne troops including parachutists and glider and transport-borne men. But all these ramifications were momentarily overlaid by the glory of the air battle of Britain. In this the new, young service had fought on its own and had saved Britain on its own. The thought came to many that if it had been beaten down, the land and sea forces—though they would have fought hard—might not have been able to save Britain and that, in consequence, the air arm was the arm of predominant importance in its independent state. It followed that the land and the sea forces were of diminished national importance. They were not only incomplete without air support (that view was to gain ground later on) but they were incapable of offering adequate resistance to attacking forces. The air battle of Britain was a great glory. It was heroic and splendid. It gave resounding credit to the airmen—the select, highly trained, physically fit, keen, disciplined, well-equipped few. It was succeeded by the night bombing of Britain which gave glory and credit to the many—the heterogeneous, drab, untrained, undrilled, confused, unfit, unequipped many. And the very heroism which surrounded these feats—but more especially the first—had its influence on all subsequent arguments and did something to retard the fuller comprehension of the all-pervasiveness of air. The public view at the time of the air battle of Britain and, though rather less markedly, at the time of the great German night assault on Britain, tended towards the thought of a self-sufficient air force, independent of the other arms. It was an over-simplification as events were later to show. But this much must be said about it; that the independent air force that fought the air battle of Britain had been created with just such a battle in view; that the battle came and that it was won by that independent air force. Even when, therefore, we differ from those extremists who advocated the absolutely independent air force and who refused to see any good whatever in land and sea forces, we admit the value of their single-minded,

single-aimed views. They did foresee a real danger and they did offer the right answer to it.

It is so important for the understanding of future events in the air war to have this remarkable paradox clear that an attempt will be made to express shortly what had happened. The proponents of an independent air force and of a full concentration on the air force, at the expense of both the land and the sea forces, had succeeded enough to cause the British Government to build up an independent air force which, when the hour came, proved just strong enough to hold off independent air assault. But that very singleness of purpose had at the same time starved the Army and the Navy of air support and had been unfavourable to all the fighting which took place before the air battle of Britain and to much of the fighting which took place after it. If, for the sake of getting this paradox clear, a gross over-simplification is permitted for the moment, it may be said that the advocates of an absolutely independent air force lost the battle of France; but won the battle of Britain. None can state that one of these battles was more vital to the allied cause than the other. If the battle of France had not been lost and if France had remained an active ally, the sea situation would at any rate have been easier everywhere and no action comparable with the battle of Britain might have been fought. That is pure speculation. It is put in merely to show that although much honour belongs to those who created an air force sufficiently effective as an independent arm to win the air battle of Britain and therefore to save England; the saving of England might have been done at one remove from the air battle of Britain if the battle of France had not been lost.

Argument about the exact position in the military scheme of an independent air force can continue endlessly. But even the most urgent advocates of it eventually turned to the word "autonomous" and called it an autonomous air force and not an independent one. In other words they had seen that in military action there can be no independent arm or indeed any independent operations of any kind. Those who strive to mount independent attacks are merely wasting effort that ought to be brought in, in its proper place with other effort. Later such matters were made plain. They were not plain earlier because the inherent virtue of the air as an all-embracing transport and communications medium had not been fully grasped. Moreover there were difficulties. I myself, an urgent advocate of air power, had difficulties in expressing my views on the co-operative needs for Army and Navy work because, whenever I did so, my words were taken as meaning that I was seeking to belittle the power of the air, or even the

Royal Air Force itself. It was the hardest thing to show that air power was linked with land and sea power indissolubly and that the essence of its importance lay in the way it enabled sea and land power to expand as it encourages communities to expand. Air power came to land and sea power as a means for vastly increasing their scope. It was an instrument and not an end in itself. That is the point. Air power is an instrument which can enable great expansions to be made of land and sea power; it is not in itself an objective. Thus had the Royal Air Force been beaten out of the skies in the battle of Britain, there would have been a subsequent stage if the Germans had wished to gain any result from such a victory. The defeat of an air force is in itself of no importance. But it leads to the defeat of an army and a navy which in the end leads to the defeat of a population and therefore of a country. Thus—to put another paradox—air war is really land war and sea war is really land war. The human being lives on the land. He cannot maintain life in the water or in the air though he has invented devices to hold him for varying periods in or on those elements. But to live he must go back to the land. So let us remember that, when it is said that Britain is a sea power, all that is meant is that Britain's land is partly consolidated and protected from the sea. And similarly when it is said that Britain is an air power, all that is meant is that Britain's land is partly consolidated and protected from the air. Interpretation of the air battle of Britain must not be overlaid by the heroic deeds of those who fought it, nor even by the overwhelming sense of gratitude that all Britons must feel towards them for beating off the enemy. It is useful to have the enthusiast, beating on the table, asserting that land armies are as out of date as bows and arrows and that all warships should be scrapped in favour of aircraft. It is useful to have the absolute all-out advocate of air power. It is useful to have men like Air Chief Marshal Sir Arthur Harris who will vow that the bomber is the only useful weapon. For it is only when the case for air power is overstated that it gains proper attention. When it has gained that attention it is easy to modify ideas and to readjust them to move towards the balanced force in which air plays its proper part so as to mirror the basic pattern which air transport is drawing as it plays its part in shaping the world of the future. Air power is expansion power. It is not a new kind of independent power. Air transport allows communities to expand; air force allows land and sea forces to expand. That is the axiom. Stick to it and the air battle of Britain falls into place in the greater pattern of war.

And now this actor, independent air power, has played his part and moves off the stage. He will be remembered. War has been enriched—and I use the term with full consciousness of many fine lives lost or spoiled—enriched by the air battle of Britain. It did so many things no other action in history had ever previously done. It showed heroism at its height and it enabled the common man to watch his defenders going into battle and driving away his enemies. It changed the world and will always remain an inspiration. But it was the final expression of independent air power. The next steps, less bright, are concerned with co-operation and integration, with the function of air power as an extensor of land and sea power. To the first of these steps the following chapter will be devoted.

CHAPTER VIII

SOME of the glory of the air battle of Britain departed during the subsequent night raiding of Britain by the German air force. That intense and sustained bombing attack has been well described by many, and here attention to it will be confined to those points in which it illumines the wider problem of the use of air power. In the air battle of Britain, which was fought in the daylight, the independent air force idea proved appropriate. The organisation and equipment had been well matched to the task and the attack was beaten off as planned. But comparatively speaking the defences against aerial bombing by night were negligible. By day the force was comparatively small; but by night the whole method and conception of air defence was inadequate. The fine engineering represented by the Spitfire and the Hurricane and the Merlin engine was of small value at night for then the crux of the problem was the finding of the enemy. It was an old problem to which attention had been devoted in 1914-18. In that war Camel night-flying squadrons had done some good defensive work at night and had shot down a number of machines which, though small as a total figure, was large in relation to the forces used when compared with the standards achieved during what later and conveniently became known as the "blitz" on Britain in 1940 and 1941. The anti-aircraft gun-fire was likewise inadequate to the task and the instrumentation woefully incomplete and undeveloped. The consequence was that the German air force contrived to put down upon Britain a large weight of explosives with a percentage loss rate which, until the last few nights—was negligible. Two and three aircraft were brought down—that was the kind of news that the people of Britain heard after they had faced some heavy night assault. The German air force did during this period show itself highly efficient at night bombing, far more efficient than was expected in view of its previous concentration upon daylight operations. We shall not know until some date after these words have appeared how the Germans contrived, for instance, to bomb London for ninety-five nights running except for three nights—a feat not repeated or approached by allied night bombers anywhere at that time, or indeed at any time within two years. When allied bombing was intensified in 1943 it was concentrated and intermittent rather than scattered and sustained. So here was another side to the picture of independent air power; the side

concerned with night attack and night defence. In that the defence seemed less effective and the appreciation of this fact led many people who had been swayed by the air battle of Britain by day to believe in the independent air force, to turn back to the thought of an air force working with land and sea forces. In other words the larger concept of air power as permeating and colouring land and sea power; both in the commercial and the military senses, began to take shape within the heads of those who studied these things. Air power was great and had saved Britain; but air power was not self-sufficient and might not always prove equally well capable of saving Britain. That is all that need be said about the night bombing of Britain at the moment. It was an agony of waiting while behind the scenes it was known that scientific workers were struggling to find a solution to the problem of finding an aircraft in the dark. Never has scientific development seemed so slow; never has a defensive air force seemed so impotent as during those days. Bold and skilful pilots took up the challenge and devoted themselves to finding the answer to the question of night defence. The scientific workers did what they could. And a partial answer was given in the last of the big night raids of the blitz period of 1940-41 when thirty-three enemy aircraft were brought down. But Britain had been knocked about a bit. One house out of five had been damaged and 120 acres of the City of London had been devastated while damage had been done all over Greater London and to many provincial cities. The Germans claim that during the month of November 1940, 6,747 tons of bombs had been dropped on Britain, of which 3,187 were dropped on London. Fifteen bombs, they said, fell on Britain for every one on Germany. The Ministry of Home Security said that the heaviest German attack on London was the night of Tuesday, October 15th, when 400 aircraft bombed from dusk to dawn. The nightly average between the 7th of September and the 30th of November was 200 aircraft. The Air Ministry gave 450 tons as the weightiest load delivered on London in any one night; but the Germans claimed to have delivered much more than this. The blitz was a new phase of the air war and it tended to refashion the views that had been forming during the air battle of Britain. But the things that were to have a greater effect in this refashioning were still to come.

While the air war had flared up over Britain and the people of Britain had necessarily fixed their attention upon it; preparations were being made by the enemy to strike a series of harsh and enterprising blows at Britain in other parts of the world. The period during which there was incessant expectation

of a German landing had its relief in the tension which held the land; but now were to come a succession of blows which seemed as deadly but which were unaccompanied by the feeling that the moment was approaching when personal action in desperate struggle would become necessary. And so there grew a feeling of frustration throughout the country; a feeling that Britain's leaders were incompetent or out of date in their ideas; a feeling that bungling civil servants were holding up the war effort and endangering the land by their dilatoriness or their refusal to depart from established custom. It was a bitter time, this time of criticism. In it feeling ran high, for when the enemy gained a victory, there was less prospect of a last heroic stand, and more prospect of a slow, drab and dismal defeat. It says much for those in command and more for Winston Churchill, that they did not at any time allow themselves to be over-swayed by these outbursts of bitter criticism, nor yet did they fail to observe the criticism and to derive what benefit they could from it. But this was psychologically a trying time, for the defeats piled themselves upon one another when it seemed that Britain ought to be able to deploy some of her real strength. Moreover—and this was the thing that maddened the onlookers more than anything else—the Germans showed a forward-looking ability and a boldness in planning and in the use of new methods that appeared to leave the British effort far behind. A clamour grew in England. It expressed itself in Parliament and in the Press. It expressed itself in conversations and in letters. It expressed itself, in short, wherever it had freedom for expression. Nor were the English critics of England alone in their criticism. They were joined by numerous additional critics in other, neutral countries even including America, although again it is to be noted that American criticism, though harsh, was always friendly in foundation. The American derided the methods of the British Army not because he hated the British Army but because he loved it and passionately desired that it should put itself right.

On air matters criticism was violent and frequent. It rose to a peak at the time of the amazing operations which ended with the enemy capture of Crete. Italy had invaded Greece in October 1940, and Britain had been asked by the Greeks for assistance in the air. A certain amount of air and Army aid had been given but it had ended in the evacuation of the British forces to Crete which had been occupied by British troops at the request of the Greek Government. On the 20th of May 1941 the Germans began an operation which must be placed alongside the air battle of Britain in the history of air war and in the history of aviation development in general. It

was an operation which illustrated even more clearly how aviation had modified the sea as barrier and could work with the sea as aid and of how aviation could minister to and nourish land activities. The airborne invasion of Crete was a great military achievement and even at the time, when its implications were clear and when it was obvious that it was costing us heavily in fine, courageous men, equipment, and ships, it evoked in Britain high admiration. It was, without question, the cause of much of the bitterness in the subsequent criticism of the conduct of the war. And this shows how advanced thought and bold, progressive methods capture the imagination of both friend and foe. The Germans sought to take Crete, and that meant that they must go there and carry their forces and supplies there by sea or by air or by both. They tried by sea; but the British Navy, even when working under appalling strategical disadvantages, was not ready to let the Germans claim even a small maritime success. Few things have been finer than the manner in which the Navy prevented the seaborne invasion of Crete. It threw in its ships in heroic style, without thought of the cost, and it did stop the sea invasion. The Navy had played its part. It remained for the Army and the Royal Air Force to play their parts and Crete would be held. There was no lack of trying. Again it was a fact that if courage and sacrifice could have won the day, Britain would have kept the Germans out of Crete. But the Germans were employing a form of technical war well studied and boldly executed. They were doing what the British War Office, not long before the war (as I can personally testify) had considered impracticable; that is they were seizing strong points in the island with airborne forces. It was the first airborne operation of its kind ever seen. It was conducted with imagination, drive and reckless determination. It seemed to show up the British generals and the British air force officers who had never, as it appeared, thought this use of air possible. It is right to give full credit to the Germans for this operation. It stands in military history and is a tribute to their ability and vision. And it showed the weakness in British military thought—in that it did not take sufficient account of air—and in British air force thought—in that it did not take sufficient account of ground.

Maleme aerodrome was the first objective of the airborne forces sent out by Germany. It was first bombed and then, three-quarters of an hour afterwards, the landings from the air began. Junkers 52 transport aircraft were used to bring the troops, and they towed gliders, sometimes two at a time and—according to the War Office account—sometimes up to five. In all there

were about fifty gliders, each carrying twelve men with their equipment, at Maleme and at other places parachutists were dropped. The parachutists jumped from low levels—not more than 300 ft.—and from a distance, according to the official account, looked like “handfuls of confetti.” The fighting was hard; but the Germans continued to pour in airborne troops, using up their Junkers 52s sometimes almost as if they were consumable stores. By the 27th and 28th of May British forces were fighting a rearguard action and then the evacuation began. Once more it was the Navy co-operating with the Army that worked well and prevented the disaster from being greater than it was. Here it was clear that when two Services worked in harmonious co-operation their total effort was greater than the sum of their individual efforts—just as a team of footballers, or policemen or anything else puts forth a greater total effort than the sum of the individual efforts. Co-operation, in short, adds something to the total effort. The reason that the Royal Air Force was unable to co-operate in strength with the Army and the Navy was given as being due to the absence of sufficient suitable aerodromes in Crete. It was a point the critics took hold of with unusual bitterness. They seemed already to forget the great work the Royal Air Force had done in the air battle of Britain in their anxiety to castigate those who had not fully appreciated that co-operation is also an air duty. Crete was the detonator for a string of criticism. Good men and patriots voiced the harshest opinions about the conduct of the war and about the failure, as they termed it, of the Royal Air Force to supply the Army in Crete with adequate air support. The few gallant attempts that were made to give the men in Crete air cover were forgotten in the general anxiety and anger about the whole affair. Criticism rose in fury when there were signs of excuses being put forward officially or unofficially. Some Ministers grew restive and appeared as if they were thinking of using the special powers that were theirs to silence the critics by treating them as persons hampering the war effort. But the criticism was too general and too deeply felt. And the gravamen was founded on utmost truth; the fact that air must permeate and inform all operations and that this point had not previously been seized by British Commanders. At this period any justifications by the Royal Air Force spokesmen for the separate service were liable to arouse wrath. In places where speech was free and vigorous there was here and there a suggestion that the Royal Air Force had “let down” the Army. Obviously such views were undesirable as well as being inaccurate. But it remained that they arose from the furious desire of every man in Britain to ensure victory and by the realisation that

they now saw the indivisibility of land, sea and air power while those they had put in charge and paid to study such matters had failed to see it and still, in some instances, seemed determined not to see it. There was at this time the demand for greater attention to aerodrome defence and to the perfection of methods for building new aerodromes at high speed. A great welling up of the national spirit occurred, but it took the form of an impatience with and a scorn for its appointed leaders. They had failed, as it appeared, to understand the essentials of air power; they had failed to appreciate what the enemy might be able to do with air power; they had failed to ensure that the Army had proper air support when it was struggling against odds; they had not understood the inwardness of air transport as an integrating force or the way in which it linked the land with the sea and the way in which, as the German propagandists boasted, it "abolished islands." All these things gave rise to this outburst of angry criticism. Accounts of the undying heroism of British soldiers and sailors and airmen whipped up the passionate disapproval of those who had put them to fight without giving them the machines, and, above all, the correct organisation. The concept of the three-dimensional military continuum, ministered to alike from land, and sea and air was being born. Inarticulate as yet, public opinion, through its criticisms and its frustrations and anxieties and disappointments, was groping towards the truth and would later voice it clearly enough.

This was a strange period of upheaval in Britain. The swelling, bubbling criticisms everywhere, the leaders and commanders trying to fend them off with explanations and excuses, the increased boiling over of criticism. And all the heat of this criticism was derived from the failure to employ air to the best advantage, and by the fact, demonstrated in Crete, that the enemy was ahead of Britain in his air thinking. He had been beaten down when it was a straight fight between air and air; but whenever territory or seas were involved, whenever it was a fight between teamed forces of air and land or air and sea, the enemy showed himself highly competent and often successful. Perhaps it is possible, now that the scene can be viewed without passion, to understand the inner feelings of so many people in Britain, at the time of Crete. It seemed so obvious, now that the Germans had done it, that airborne forces used boldly and heavily enough, could defeat land forces without adequate air cover. Crete, the strategical key to the Mediterranean, was known to be a place we wanted to hold. How was it, common sense asked, that our leaders imagined they could hold it when they knew

before the evacuation from Greece had occurred, of the shortage of Cretan aerodromes and were therefore aware or ought to have been aware, that our land forces there would have to try and fight airborne forces without themselves having air cover. Every man who voiced such criticisms had the feeling within him that he had seen these things clearly, yet the Generals, the Admirals and the Air Marshals had not. He had noticed relationships between air and land and air and sea which they had failed to notice. He had made a truer appreciation of the position than the experts in the highest places with all the information at their disposal. No wonder that the thought went through the country that something was seriously wrong with the choice of leaders; no wonder it was widely believed that good men were being kept out and bad men put in; no wonder all the critics compared their appreciations with those of the commanders to the disadvantage of the latter. Crete was a great military experiment and a historic operation. German war thought and war doctrine attained a peak of excellence in this campaign. But the taking of Crete was a greater thing than a tribute to German military genius; it was a revelation of the indivisibility of air, land and sea power; it was a demonstration of the three-dimensional military continuum.

Had there been no signs that the lessons of Crete had been learned, there can be little doubt that the criticism would have grown in volume and violence. The people, desperately determined to win the war after overcoming the worst threat of all, were not going to have their labour and sacrifice brought to naught by blindness in the military or political heads and still less were they going to have them brought to naught by inter-Service rivalry. Heads of the great fighting Services owe loyalty to those Services in the manner which has already been explained. And it is therefore permissible and indeed, up to a point, right that the head of a certain Service should be an advocate for that Service and should display always a belief that it is a more important and more capable Service than the other two. But when great countries are at war and huge issues at stake, inter-Service rivalry must be restrained from going beyond the point where it provides stimulating competition and must be prevented from setting a brake on progress. Fortunately for the heads of the Services—perhaps most fortunately for the head of the Royal Air Force, now Sir Charles Portal—and fortunately for the head of the Army though to a less extent; and again fortunately, though to a still less extent, for the head of the Royal Navy, there emerged from the sands of the western desert the pattern of co-operative land-air battle. One

man there above all others, Air Vice-Marshal Arthur Coningham, afterwards created Sir Arthur Coningham, was working out this pattern in the western desert and with the support of the Commander-in-Chief, the Middle East.

Coningham, a large, blunt, but thinking New Zealander, had more air-fighting experience than most of those in high positions in the Royal Air Force. He had displayed the highest courage and address in the war of 1914-18 and had won decorations for bravery in combat. He had burnt into him an experience of air fighting. But he had in addition a cold, clear view of air war in general. He neither glorified it beyond its means, nor underrated it, and he worked in the Western Desert to remove for ever the charge that the British Army did not receive good air support in its operations and that its need in this respect was not widely enough appreciated in the Royal Air Force. Coningham had with him units composed of men from the Dominions and from the mother country. They had "desertised" aircraft of various types, most of the types being a grade down in the scale compared with those in use in Britain. Under General Wavell, under General Auchinleck and under General Alexander, Coningham worked within the three-dimensional operational frame, fitting in his air work as carefully as a watchmaker fits a jewel. His immediate superior, Air Chief Marshal Sir Arthur Tedder, aided him with all his power. He knew that there is less immediate glory to be had from air work which is co-operative with land work than from independent air work. He saw as clearly as any—for as a fighter pilot himself he could hardly fail to see it—that an air force working independently would be more likely to gain renown for itself even if the concurrent land operation went completely wrong than an air force seeking to serve the ground troops first and to discipline its own fighting and long-range bombing to that end. But he also had the military understanding to see that air power and land power and sea power are indivisible, and so he used his dominating personality, his prestige as a commander who had been through more than any of his officers and airmen and who had proved his skill in combat, to develop and to perfect the technique of land/air co-operation. The work went on steadily throughout the ups and downs of the North African campaigns. It went on right up to what, in these pages, will be regarded as one of the great periods of the war, the amphibious operations for the landing of United States and British forces in French North Africa. It produced the perfect pattern of land/air co-operation, a pattern which must be regarded in the future as the starting-point for other

and perhaps larger operations and which found fully successful application in Tunisia, Sicily and Italy.

It is difficult to express the basic idea of this co-operation; but it may be held to be this: that an air force working with an army as in the Western Desert, must seek to exert its strength at the points where mutual pressure is highest. Thus at the beginning of an offensive, when the enemy is in well-prepared positions, as at El Alamein at the time of General Alexander and General Montgomery's successful attack, it must first of all help to clear the immediate foreground. It must concentrate its effort just ahead of the troops that are preparing to advance until they are moving and as the enemy's resistance-front moves back so must the air force move its *point d'appui*. In the defence the aim must be to protect the forward units from the enemy's assaults and only if there is a retreat must the rearward units move up in their priority of protection. A fluid condition, therefore, prevails as to the priorities of attack for an air force working in real co-operation with an army. It may be called on to devote all its machines and to cause its officers and airmen to make all their sorties, for dealing with enemy resistance near the front line. Or it may, if the enemy is fleeing fast, be called upon to reach far ahead of the forward Army units and to harass and to hold up the retreat. Long-range strategical bombing may come into the picture; but it is not likely to do so to a very large extent unless the lines of supply present clearly defined nodal points—a condition which did prevail in North Africa owing to the limitations as to the numbers of ports with heavy installations which Field Marshal Rommel could use for bringing in supplies and reinforcements from Italy. But all long-range strategical bombing, in this land-air concept, must minister to the first and immediate aim of stiffening, strengthening and protecting the spearhead of the land forces. The air force must provide the two essentials to successful advance in the face of the enemy, the shield and the sword. It must hold the shield just in front of the forward troops and it must brandish the sword near or far according to whether the enemy rushes in or steps back. That fluidity in disposition was the essence of the successful air/land co-operation in the Western Desert. It was to be seen in varying degrees of development in every advance and every retirement there. The air forces, it is not too much to say, saved the Eighth Army when in 1942 it was pressed back to Egypt and General Auchinleck took personal command of it. It had much to do with softening the enemy's carefully prepared defences in readiness for the powerful assault made later by General Montgomery under General Alexander.

That was air co-operation in its best form and its development must be acknowledged mainly to Air Chief Marshal Sir Arthur Tedder and to Air Vice-Marshal Coningham, a great pilot, a great leader and also a great and thinking commander.

It is appropriate to pause here and to notice how the progress of the air war had gradually built up a fuller understanding of the basic influence of air transport not only on military operations, and on strategy and tactics; but on the whole world pattern of relationships, national and international. A tremendous conception was being forced upon the notice of all thinking men by the drama of war. Where before they might have allowed the unbiquitous power of flying to pass unheeded for generations, it was now forced upon their notice by the deaths of friends and relations and by the imminence of disasters and tragedies. It is not too much, perhaps, to see this world war as the emotional stimulus which was to lead to a fuller grasp of the new relationships between states. The world war, tremendous though it was, may be merely a small part in the grander picture of the expanding communities of the earth; it may be nothing other than a *hint* that the peoples of the world had not been showing the comprehension of their achievements which was demanded by the fundamentals of biological progress. Perhaps such speculations may seem fantastic; yet they are heard as the background to so much that has occurred in history. The upheavals have come around the times when the introduction of some new achievement of applied science is opening up the scope for growth, while the organisation and political thought of the time restricts that growth. The recurrent revolts against the machine may (and I put forward these views with diffidence and in readiness to modify them if better explanations are furnished) be one of the resistances against which growth must strive. The growth of most things has its checks and limitations. It is confined at some moment and then there is a trial of strength between the restricting influence and the growth. Sometimes—as when the toadstool pushes up the paving stone—the principle of growth wins; sometimes it loses. May it be that the communities of the world are in process of growth and that air transport is merely an agency which provides the means, the soil and sun, which stimulates growth but that directly the growth begins the resistance comes into play and artificial checks are put upon it. At the outbreak of war the countries of the world had the means of expansion placed at their disposal by the physicists and the mechanical engineers. They had radio and they had air transport. But instead of permitting the natural sequel, the expansion

of communities which, in the past, had invariably followed improvements in transport, they sought to place artificial restrictions in the way. There were restrictions upon travel and upon trade. There were restrictions upon speech between country and country. There were all imaginable limitations to hold the countries within their bounds and to prevent them from expanding and spreading out like the amoeba and absorbing one another in larger communities. Here were the means and stimulus to growth, and the artificial bonds. The result was a struggle of power though always unseen and unappreciated. The peak of the struggle was war. And that war enabled the principle of growth to overcome the principle of restriction. The Atlantic Charter was the first articulate and public declaration which showed that the compulsion placed upon communities to expand was recognised by the great political leaders; it was the first admission that communities have within them the urge to expand and that, when the means is available, they will expand or die. It was followed by other similar admissions. Is it, I repeat, too fanciful to assume that these were signs of recognition of the basic principle that the urge to grow is in communities as much as in men and that when the means are available and the conditions appropriate, growth will start and artificial means of restricting it be eventually burst asunder? Is it incorrect to say that a few months of war had acted as revelation and had brought to notice things which had not been seen in the years of peace? The horrible spectacle of civilised France overborne by the sweep and savage onrush of mechanised units collaborating with aircraft; the desperate effort to save England after Dunkirk as the enemy pushed out his organs of growth over the British Isles; the revelatory flash of Crete and only then the beginning of response in the United Nations in the Western Desert. The operations in the Western Desert were the beginning of understanding in the United Nations; they were the beginning of the full appreciation of the weight and power of the forces of growth and expansion and of the way in which aviation is interwoven in all modern designs and plans. Air power is indeed the stimulus to and the cause of the next great step in world growth from the countries to the commonwealths; but it is not self-sufficient and must be woven with the other processes and stimuli. Complexity is the mark of natural processes; those who saw air power as a separate, self-sufficient thing, over-simplified. It was the lesson of war that taught them to think more widely and to cover with their thoughts the greater complexities of collaboration and inter-relation. So the operations in the Western Desert throughout the first three years of war and still in the fourth

year, were revelatory. But they had a limitation and it was that they were concerned in the main with land/air co-operation. But it has been pointed out that air power permeates and colours both land and sea power and that the three must be looked on as parts of the modern military continuum. And before the collaboration between land and air forces had been brought to its highest pitch by Air Chief Marshal Sir Arthur Tedder and Air Vice-Marshal Sir Arthur Coningham, the testing time for air/sea co-operation had begun. It was on the 7th of December 1941 that an event occurred which completed the circuit of world significance and put the war in its place as an influence on all communities. This was the attack on Pearl Harbour by the Japanese. It brought the United States into the war and it produced a sea/air side which was equal to the land/air side of operations. In the next chapter some of the actions in the Pacific between combined sea and air forces will be considered in so far as they relate to the central theme of air power and its effect in stimulating and providing for the growth of communities.

CHAPTER IX

BEFORE the 7th of December 1941 the United States of America had been a spectator of the war though she had at every stage shown her benevolence towards Great Britain. In the minds of all who were involved in the war the United States stood in the background, tall, and powerful. Her shadow fell upon every operation and every move. At Dunkirk the absolute determination of Britain to hold on was backed by the belief that the United States would, in the end, step in and right all wrongs. It was thought then that even if Britain went down the reverse of fortune would come when the United States finally came into the war. And at no time was it thought likely that the United States would stay out of the war right to the end, though there was full appreciation of the fact that she must not be called upon as if she were already an ally and that she had the fullest justification for staying out of the war so long as she thought desirable. It was one of the things which can be set to the credit of the British people that they did not harp at the Americans or even pretend that there were any ties which prescribed that the Americans should come to their aid. And when they did come to their aid they were appropriately grateful. It must be set to the credit of the Americans, too, that, being far from the scenes of battle and—apparently in a position to stay out of the war altogether—they yet came to the aid of Britain with all material resources and spoke boldly and openly in favour of Britain at all times. The courage and greatness of the Russians in battle was shown with dramatic intensity during the struggle between the Soviet forces and the German forces on the Eastern Front; but the fact is that the Russians showed no love for Britain at the earlier stages of the war. It is, of course, totally irrational to expect love from one country to another or to expect a country to act for affection or for belief in the principles actuating another country. Britain showed no anxiety to aid those in Spain who fought for the principle she later embraced nor did she even express publicly and officially any particular approval for them. She seemed merely anxious not to annoy the other side. No such niggling littleness of spirit ever held back the United States of America. In the free press of that country outspoken and urgent opinions in favour of Britain were given at all times. The chances of Britain holding out were regarded for a period as negligible and the Americans did not hesitate to say

so. But at the same time they expressed their absolute sympathy for Britain and their contempt for the enemy. America was now to come in on the same side as Britain. Already, however, an interesting and significant link had been formed between Britain and America, the link by air across the Atlantic ocean. The ferry and transport services which were running over that 1,800 odd miles of ocean which Alcock and Brown had first crossed by air in a single stage in 1919, were services which illustrated as well as anything the wider aspects of aviation's functions in war and peace. To take these ferry services at the lowest level of value, it is to be noted that they increased the efficiency with which factories in the United States could nourish offensives based on Great Britain. If aircraft are to be carried by ship from the United States to Britain they must first be dismantled and then given protection against the corrosion that can be started by sea water and sea air. All surfaces are coated with a protective grease and joints are sealed with adhesive tape. Then, when the aircraft arrive in pieces at the ports of destination and are prepared for assembly and test flight, they must be de-greased first of all by hosing with hot paraffin and all adhesive tape must be removed and the parts cleaned. That alone indicates the measure of importance of the air ferry service for the delivery by air of new machines to Britain; but it is a small thing relative to the part played by such a service in transforming world proximities and in cutting away the time-distance frontiers between great countries. The Atlantic service developed rapidly throughout the war and was amplified by numerous other services, one running across the African Continent and feeding the forces in the Middle East. These things, however, were air operations at one remove so far as the United States was concerned. They were backing up Britain but not themselves directly involved. Then the attack on Pearl Harbour brought them in and opened the way to some remarkably well-planned work with sea and air forces in collaboration.

The United States were in the end to do a great deal in developing and spreading the idea of air power as an all-pervasive influence; but their first achievements must be said to concentrate upon that puzzle, the aircraft carrier. It was, in a sense, through the carrier that the influence of aircraft over sea was first indicated. The carrier may be an interim vessel; but in the year which followed the outbreak of war between the United States and the Axis powers it wrote sea-air history. The carrier from being despised and disliked, became the protagonist of sea-air war. Carrier construction was accelerated. The light carrier came into service. The actions of the

Coral Sea and of Midway Island in the early part of 1942 were great in themselves and were the cause of greatness in other actions. In them fleets at sea clashed through the agency of their aircraft carriers and aircraft. There was no fleet action in the earlier sense; but carriers put up their aircraft when the fleets were within range and the rest was a desperate and novel struggle to strike first and hardest. United States naval airmen performed prodigies of valour. Their losses were extremely high—a thing which did not emerge immediately owing to censorship. At the Midway Island battle of June 1942, for instance, thirty-five out of forty-one torpedo-carrying aircraft belonging to the United States Navy were lost though the fact was not made known officially until November. The Japanese had sent out an invasion fleet of eighty ships. Reconnaissance, by night as well as by day, by Fortress and Catalina aircraft gave the United States fleet time to prepare. The Japanese carriers *Kage*, *Akagi* and *Soryu* were all hit and so was the United States carrier *Yorktown*. It was a battle of ideas as much as of men and machines and both sides were employing new and comparatively untried means. When new things are being tried the expectation is that they will have full success at once or full failure. And we have to note one of the greatest acts of faith in major battle by the United States commanders. They were trying, it must be recalled, to strike at the Japanese fleet from long range by means of aircraft. Up to that time ship-borne aircraft of the torpedo-carrying type had been used in very small numbers, formations of about six being normal. This time the United States sent off fifteen torpedo carriers. It was the right policy to step up all previous practice and to seek by numbers to overwhelm, thus giving the chosen form of attack its maximum chance of success immediately. But none of those fifteen torpedo carriers returned. It was a sign which the boldest commander, working to a novel and untried plan, might well have interpreted as a warning. The United States fleet might well have withdrawn into older tactical methods after that seeming initial failure. But it did not. It poured its aircraft against the Japanese and did, in the end, overwhelm and defeat them. It was the first introduction the world had had to United States sea/air methods and it showed that in the newcomer to the war the allies had a nation ready and willing to introduce new methods and to force them home and especially a nation which showed some sign of knowing that sea, land and air power were indivisible. In the United States itself there were those who advocated with the utmost vigour the formation of a separate air force as in Great Britain. But earlier than these there had been

General William Mitchell who had overstepped these people by proposing the single service with the co-equal departments for sea and land and air within it. However, at the time of these great sea-air actions in the Pacific the United States was showing a more advanced line of thought on the subject of the use of air power than the enemy and in some ways a more advanced line than Britain had shown. British carriers had taken part in some great actions and had shown to the full the traditional determination of the Royal Navy, but the disposition to transfer great responsibilities in fleet actions to the carrier had not been displayed by the British Navy—perhaps because suitable opportunity had not offered. The British Navy had used aircraft with great effect and the feat of Taranto was a pre-view of future events. But in a major fleet action at sea the United States Navy was first with full air co-operation.

Consider now the part of the aircraft carrier, for it had its effect in developing the wider vision on air matters which must in the end lead to the recognition of the indivisibility of air, land and sea power. The carrier was created as a naval vessel because the range of aircraft was too small to permit them to accompany and to work with the fleet at sea. The operational radius of the ships forming the surface fleet was enormously greater than the operational radius of naval aircraft. The torpedo carrier might have an operational radius of 200 miles only against the vast, ocean-reaching radius of a warship. Moreover the time factor played its part in determining the need for aircraft carriers. The duration of a ship at sea was even greater in relation to an aircraft in the air than the operational radius. The ratio is more extended. The ship could lie up for a time which the aircraft could not do. For these reasons the scheme for carrying aircraft in ships and launching them so that they could take part in battles at sea and then again taking them back into the ships, was developed. It is doubtful if, when the first deck flights were made before the war of 1914-18, there was a clear understanding of the reasons for the building of aircraft carriers; but the reasons were apparent enough at the outbreak of the war of 1939. At once the carriers became the hardest worked vessels in the fleet. By the end of 1942 six of the Royal Navy's carriers had been sunk. They were employed at the outset largely for making reconnaissances. Large areas were searched by carrier aircraft as they performed their regular duties. Then, second in order, there came the simplest application of the carrier, for providing an air striking force with a base near the objective. This happened in the attack on the Italian fleet at Taranto. In the Pacific actions two mobile air bases, or sets of mobile air bases, held

by the opposing sides, came into conflict and the aircraft they sent off struck mutually at the bases. The aircraft from the American and the Japanese carriers were like the clubs flung simultaneously by two jugglers standing at opposite sides of the stage. They leapt from their starting-points, crossed in mid-flight, and struck each at the other's place of origin.

Fighters performed their part in the Pacific actions and it is only in order to clarify the basic tactics of the battle that, in these remarks, the emphasis has so far been placed on torpedo aircraft and bombers. But there must always be a fighter background. The fighters remain near their bases and seek to ward off the opposing torpedo aircraft and bombers. But all sea-air actions and all considerations of the scheme of sea-air battle, lead back to the aircraft carrier. The most despised type of vessel had become the most important. It must be accorded to the United States Navy that it played a big part in influencing all future operations by fleets at sea in the two early Pacific ocean actions mentioned. They were followed by other actions which began, though on a small scale, to bring the land side into the picture as well as the sea and the air. In miniature they were the shape of things to come, with the three-dimensional military continuum emerging. In the actions fought for the aerodrome at Guadalcanal in the Solomons, the balanced force comprising elements of all the arms went into action and again foreshadowed future events. It is not known, as I write, what part exactly was played in this boldly comprehensive planning by that spectacular figure, General MacArthur. He, as commander-in-chief in the region, must be supposed to have influenced the scientific and cunning use that was made of air power as an element of all power. The name of Admiral Chester Nimitz must also be mentioned. These men, together with others not named, helped not only to put the United States fighting forces on a sound basis and to devise sound tactics for them, but they also helped to put air power in its correct place as the colouring matter and shaping tool of all power. They helped to show in action what had begun to appear in theory, that air transport was a development which would affect all future developments, civil and military, and that it was a development which in itself ministered to an enlargement of human interests and therefore an enlargement of all communities with a corresponding enlargement of the zones of peace and the zones of war. In aviation war has its victories no less renowned than peace and they are concerned mainly with revelation, with the forcible showing of the powers of aviation to those who are sluggish to believe. The United Nations had done lip service to aviation before war

broke out, but they had not used it fully. They had tried to cage it, and, caged, it pined and would have died except for the coming of war when it was released into the dangers of the world. Let aviation not be caged again. If the attempt is made it will lead to other perils. Aviation must span the world and weld the world. America was readier on the whole than the older nations to see the power of aviation and to seek to use it to the full. She had developed her air-transport systems before the war with zeal though always within the national cage or at any rate the cage constructed of the bars of national sovereignty over air space. So it was good to see that she was determined to employ aviation to the fullest extent when war came. Those deeds of the carriers of the United States Navy were great deeds. Clinging to the reeling ships the crews fought their aircraft with a heroism which knew no bounds. The aim was one only, to keep the aircraft in the air. To that end great risks were willingly run and men handled the unwieldy vessels as if they were toy boats. They fought fire and high explosive while the aircraft took off and landed. They took in the aircraft of other, crippled, carriers, and always saw that machines were kept in the air above the battle. No more fearful strain has ever been put upon mankind than to handle a ship in the face of every fury from the enemy while all the time being restricted in manœuvre by the fine, invisible thread connecting the ship to aircraft wheeling above the battlefield. It is hard enough on a ship's crew to fight when the ship is free to manœuvre as surface tactics dictate; but when there is always that invisible thread from carrier to aircraft in the air, there is restriction and all the dreadful consequences of having to face great risks without the means of escape. Between the carrier and its aircraft the umbilical cord, though invisible, is vital to the air crews. It must not be stretched or severed and the carrier must steam into hell itself to give its aircraft their refuge when fuel runs low. Some tremendous attacks have been made on aircraft carriers and the story of them is one of the great stories of the sea. The Royal Navy's *Illustrious*, when she was subjected to repeated and heavy dive-bombing attacks on her way to Malta, stood up under a pounding which would have been thought fatal if it had been theoretically studied. Men sighted and fired guns under conditions such that the human nervous system must have been lacerated with apprehension. Around Crete the destroyers and light cruisers had gone in time and again under the dive-bombers; but they had none of the carrier's complications of deck aircraft operation to contend with and to that extent their trials were less than those of the carriers.

All this courage and all this seamanship and air skill were centred upon the theme of the permeation of sea power by air power. In the Pacific the United States Navy did what the Imperial and allied air forces under Air Vice-Marshal Coningham were doing in the Western Desert, they were demonstrating the all-pervasiveness of air power and were indicating how it extended the scope of military operations. The means of expanding the peaceful community was also a means of expanding a war. And connected with the United States use of air power was their productive capacity. The factories of America for the making of aircraft were established on a large scale during the period that they were helping to feed Britain's fighting forces; but they grew at a fantastic rate directly the United States themselves became involved in the war. Air war and the scope of air power in both peace and war are so intimately connected with output that something must be added about this aspect of the American air effort.

Before 1939 the United States had earned throughout the world recognition and often jealousy on account of the proofs they had given of their power to produce motor-cars in larger quantities and at lower prices than any other country. Remarkable efforts in production had been made by Britain and by Russia and by Germany. France too had sought in some of her great factories to challenge the speed and magnitude of the American output; but all such challenges were vain. American output went so far ahead of the next largest that it was in a class by itself. And the quality of the goods made improved until they compared well with more laboriously turned out articles in the smaller, slower factories of other countries. Here we recognise one of the things that influence the future of air transport and of the part it can play in the expanding community. Aircraft, like motor-cars, are highly complicated things, difficult to design and to produce. But the call of war altered the rhythm and methods of production without making the aircraft less complicated (indeed they became steadily more complicated). The American factories looked at the problem in a big way and toolled up in the biggest way. That was one reason for their great output per head of the labour force employed, a force which surpassed 1,500,000 at the start of 1943. But in addition to this there was a scientific approach to the whole problem of large-scale series production. At this time the method of statistical control of quality came into the aircraft factories and was increasingly trusted and used. It is a means of rationalising the tolerances to which the parts are made and at the same time of relating these tolerances to one another and also to the operational duties of the finished article. Statistical

control of quality lowers rejections and, as the name implies, improves the control of the factory work at every stage. It was typical of American industry that it seized on statistical control and used it extensively. The United States, then, represented not only sound thought in its sea-air operations; but also gigantic capacity in its output of aircraft. The country with the great distances had given birth to transport systems capable of covering those distances in short time; the country with the oil on which to run them had developed an almost magical ability to produce aircraft and aero-engines of good quality in vast quantities. At the end of 1942 the announcement was made that 48,000 aircraft had been built by the United States during the year, that the output was still rising rapidly and that during the last month of the year 5,500 machines had been made. In 1943, although the weight per aircraft had risen, the monthly output soon exceeded 7,000 units. So the United States was an essential element in the air background to war and peace; it was the country which seemed singled out by nature to play a leading part in air progress and it was beginning to show aptitude for that special leadership. The tendency was not seen in Great Britain entirely without misgiving because there were those who, nurtured in a competitive world, still looked to a future of commercial prowess and prosperity and to a form of competition in which they would have at least as good a chance as anybody else of attaining a leading position. The business men of Britain had not allowed the Americans to capture the car markets of the world without a vigorous struggle and without some—commercially—splendid counter-attacks. While the world remained, therefore, as a set of competing countries, large in number and all capable of being turned into markets for manufactured goods, the British business man was right in competing tooth and nail with the American and the American was right in competing tooth and nail with British. But conditions changed with the outbreak of war not only because there then came into being the coalition of nations described by President Roosevelt as the United Nations, all engaged in a common cause, but also—though this point was not publicly made—because aviation had moved to the time when it provided the means and the stimulus for national expansion and for the creation of world aggregates larger than any created up to that time. When aviation began to play this larger part it predicated the larger coalitions which were forced upon the United Nations by war; but it also suggested that such coalitions must continue to exist during peace. It suggested this not because some political party in power advocated such larger coalitions, not because such larger

coalitions were necessary for self-protection; but because for some reason as yet not clear there is that compulsion to expand. An aircraft designer was urging upon the attention of those ministerial authorities who could authorise the building of new types of aircraft, the claims of a bomber much larger than any that had been built up to that time. When the question of whether to go forward with the prototype came to the level of those who spoke in such matters on behalf of the Air Staff, the point was raised as to whether a bigger machine was tactically sound. Would it not, for instance, be an easy mark for anti-aircraft artillery? How would it manœuvre in order to evade attacks by fighters? What of the problems of housing and camouflage? The factories in which it would have to be built would have to be larger than other factories and this brought in the difficulty of finding sites; servicing would be difficult and some parts would be so large that their transport by road or rail would be difficult or impossible. Many such points were raised and urged against the claims made by the designer for his ultra-large aircraft. But he answered them all by a totally irrational, yet curiously impressive statement, that bombers would grow in size in spite of all difficulties and that the reason they would grow in size was because in war everything always did get bigger. Had anybody heard of things getting smaller in war? It was an unenunciated law that everything got bigger and he was ready to stake his reputation and everything he had on the belief that bombers would get bigger. That man was right. His unenunciated law has all the appearance of a law and perhaps the day will come when somebody will enunciate it. There is, in the machines of war as in wars themselves, an inevitable, ceaseless, unescapable tendency to grow in size. Why wars should not get smaller and smaller—especially as they seem to get more and more unpopular and commentators lose no opportunity in pointing out that they get more and more unpleasant—is obscure. It is easier, perhaps, to see why guns should get bigger and why warships and military aircraft should get bigger. That they do all do so is ascertainable by merely looking through the works which cover the history of such things. And with communities there is the same growth and the same utilisation on a growing scale of the means of growth. So the United Nations, huge combine, came into existence to counter that other huge combine the Axis powers. And it is a pattern that must make its mark of bigness and be followed by commercial combinations of similar growth. Aviation is the instrument for enabling certain kinds of growth to take place and the United States of America is pre-eminent in the arts of aviation. It follows that it will utilise those arts for

the purposes of compelled expansion. And the first step is the widening of the scope of aviation and the re-arrangement of it so that it permeates all other similar activities. The Pacific war and the actions in which United States forces took part in the early stages were earnest of the enlarging scope of the aviation to come.

CHAPTER X

EVENTS of the war have been used to illustrate the part aviation was playing and the way in which it was developing. Air war has been treated as revelation. The peace-time peoples did not see that aviation provided an instrument of expansion, but the war-time peoples were forced to see it by the compulsion of military fortune. But in the last chapter something was said on the larger aspects of the affair; on the bearing which aviation might have upon the development of world combinations much greater than any previously seen. The British Commonwealth of Nations was grown out of sea power; it represented in the years between the war, the largest practical agglomeration of peoples to which sea power could give adequate sustenance. Indeed to some it seemed to have slightly overstepped the practical size limit. It took the events of war to show that aviation was not a thing on its own, separate from all other activities, but bound to land and sea activities as much as the sea was formerly bound to land activities. But perhaps these events were also an indication—and as always we put these larger views forward with diffidence owing to the complexity of the issues they raise—that the time had come for communities to expand or die. The struggle between the motor-car industries of Britain and America before the war was symptomatic not of commercial drive and vigour, but of the inadequacy of the world state structure to contain modern industry. It became clear that a battle was being waged between Britain and America. Indeed the great industrialists in Britain did not hesitate to call it that. And they spent large sums and exercised a big effort in persuading the people of Britain that it was “unpatriotic” to buy an American motor-car. This was the time of the energetic “buy British” campaign which was to some extent effective in its immediate purpose; but which was perhaps, launched without adequate appreciation of causes. The struggle between Britain and America was seen as nothing other than a commercial struggle such as had occurred tens of thousands of times between business firms. Its deeper significance—I dare say—was not seized. It took war to point that significance. And as the war proceeded so did the emphasis in this direction grow.

In 1939, before the United States had entered the war and before the Soviet Union had entered the war, I used habitually to express to my friends the view that the sole winner of the war would be the United States

of America. It was a statement which, for obvious reasons, could not be made at that time in public; but it was possible among trusted friends to make it and to argue the reasons which gave it probability. They were that the war must inevitably develop most swiftly through the medium of the weapon which could colour and shape all operations, namely the aeroplane, and that the United States of America were the most expert country in the world in the production and operation of aircraft. The added point was made that the United States were the country best able to obtain large quantities of the oil on which air action depends. The prediction that the United States of America must in the end be the winners of the war, therefore, had a reasonable foundation if it were accepted that air action would colour all other kind of action right through the war and after it. But many of those to whom this argument was put suggested that Soviet Russia, also a country with supplies of oil available and a country which had done much to build up her industrial efficiency and which at that time was not being damaged by the ravages of war, might in the end prove the winner. And when the truly magnificent Russian defence against the German attack of June 1941 was demonstrated, the view that Soviet Russia would dominate the air world of the future received some support. It is useful, before embarking upon an attempt to sort out the flashes of revelation which the air war provided and bring them together in a steady stream of light, to examine briefly the part that Soviet Russia played in the exposition of air power.

In 1939 Russia was an enigma to the people of Britain and perhaps partly because of the small amount of knowledge of her doings, there was the most violent partizanship. There were those who believed that Russia was the mightiest and most powerful country on earth and that she had carried productive technique far beyond anything seen elsewhere. There were those who believed that her mode of life was far finer than any other. There were those who almost worshipped at the altar of Russian ideas and ideals—or rather at what were supposed in England to be Russian ideas and ideals, for the two were not always the same. Those with no distinct political leanings, who disliked some of the things they heard about Russia and liked others; were apt to be strongly influenced by the actions of the Soviet Union towards Germany and the war. For the reason that they mostly believed that they were on the right side and the side of right, they expected Soviet Russia to come into the war against Germany at once. The Soviet-German pact came as a sharp blow to them and was, without much doubt, the starting pistol for World War II. The English and American peoples were not

at that time fully aware of the military issues which would influence victory or defeat in battle. They still regarded the war as a crusade in which it was necessary to plunge at once if word had been given that that course would be adopted. It was not then accepted that the Soviet leaders were studying the war from another, purely military angle, and were weighing their chances of victory. Mr. Neville Chamberlain has often been excused for his part in the immediate preliminaries to war, for his vacillations and weaknesses, on the grounds that he was playing for time in which to prepare. If that was true the preparations ought to have been more complete than they were. And in any event the people of Britain, whatever their failings, do not recognise any excuse of unpreparedness for breaking the country's word to another country. If Poland had been promised that Britain would come into the war if Germany attacked her, the British view was, then no excuse could be sufficient for failure or even for delay in coming in when the attack was made. It was better to keep one's word and have one's head blown off in an ineffectual effort of aid, than to hold back in the hope of preparing aid. The British people had swallowed enough humiliations in the Czecho-Slovak negotiations and they were not prepared to accept any more. They would have preferred at this time, had the question been put to them, to go down fighting than to hesitate in redeeming a promise. The Russians were under no such odd compulsions. They had not made promises which they might be unable to keep; they had not been humiliated by Herr Hitler as Britain had been. They had not been guilty of "letting down" a nation which had trusted in them. Lofty and alone, enormous and mysterious, the Soviet Union was master of its own moves and it preferred to determine those moves according to military expediency and to leave wild emotional surges of generosity unbacked by military force, to the Anglo-Saxons. At this time the part played by Russia seemed to the non-political Briton sinister and selfish. There were the Soviet statements already referred to, which favoured Germany at one moment and Britain the next. There were the rebukes, scattered with approximately equal partiality. The Anglo-Saxon, seeking to find the mainspring of conduct in the likes and dislikes of a country as of a person, was at a loss to understand the Russian conduct. But he was not particularly bitter about the Russo-German pact. That seemed to be at that time merely a means of securing safety for Russia at the expense of any other countries the Germans might choose to attack. In short the Soviet Union was a mystery as to its military and air strength and an enigma in its political activities. Had it been known at this

time that the Russians were in fact extremely powerful in the air and on the land, indignation might have arisen over the Soviet acts of temporisation and isolation. Only those who had a political bias in favour of the Russians, however, were convinced that what the Russians were doing at this time was entirely necessary for strategical reasons. A warmer more generous impulse was in the breasts of the English people and they could not admire or even accept a cold and calculated strategy at such a moment.

But cold and calculated the Russian strategy was. It sought some slight preliminary strategical advantage. It sought to hold off German attack while at the same time avoiding the servile note which had crept into the ultimate statements and acts of the lesser nations just before the Germans devoured them. It tried to keep up a semblance of confidence in its armed might, yet without saying anything about it, and at the same time it tried to keep on the right side of the Germans. The Russian military commanders, it must be supposed, recognized the German military might and although they alone knew that their own country was also formidable on land and in the air, they did not think that they had a sufficient margin over the German might to enable them to risk a conflict. It was the strangest of all positions for a great country to be in for it entailed the weirdest public utterances at a time when the world scrutinised every one of these utterances with the closest attention. The mighty fighting of the Russian armies has obliterated the hard feelings that some of those in Britain had towards Russia during this early period. But looked at now, with an impartial eye, it will be seen that Russia was guided at this critical period by her head and not by her heart; by her almost mathematical outlook upon strategical problems and not by an emotional desire to help this or that country because there was a feeling of sympathy for this or that country. The Russians betrayed little or no sympathy for any country at this time; and in the light of subsequent events it was as well. For had Russia been less well prepared when the Germans made their sudden attack in June 1941; had the Russians been less well placed strategically; had they had less time to complete their dispositions, they would assuredly have fallen before the fury of the mighty onslaught the Germans had prepared for them. The turn of fortune's wheel has never been more astonishing than in this. At a time when Britain most needed help, Russia held off and incurred the suspicion and even the contempt of many Englishmen; yet later when the Germans attacked, the splendid Russian resistance, which was partly the outcome of their earlier coldness to the plight of others, won back respect and fanatical

admiration. It is idle to speculate about whether, had Russia come to some agreement about combined action with France and Britain, war might have been averted. Britain had earlier done as much to antagonise Russia as she had done to incur the suspicion of France. When France saw the German menace growing and sought British help and support in nipping it in the bud, or rather in the Ruhr, Britain held off with protestations about the peace-loving qualities of the Germans and the ineradicable war-like qualities of the French. What a sorry recollection it is, of those days before England was aroused to finer feelings and clearer appreciations! It was Britain who had made it almost impossible for France and Russia to work with her in full accord and who then—occasionally—seemed inclined to place some of the blame for later troubles on France and Russia.

This much is to be noted, that while Russia stood, there always seemed a hope of diverting the fury of the German hordes from Britain while armaments were made. It was known to the wider public in spite of the attempts to conceal it, that Britain was almost unarmed. The astounding farce of the early war-scares, when antique guns appeared along the Thames sides, representing almost the anti-aircraft gun defences of Britain, had given the key-note to those who weighed and guessed. So now the need for a respite while arms were made appeared. The need for a respite, especially while the Royal Air Force was built up to a size which would allow it to cope with the German air force, was recognised and it was also seen that Russia was the only country that could provide it. While Russia, unknown and mysterious, stood on Germany's eastern frontier, the chances that the Germans might pause long enough remained good. But the feeling was that, if Germany did attack Russia, the contest would be over and Russia defeated in a few months. For the Russians, not trusting anybody with their military secrets, had admirably kept the facts about their strength from becoming known. It seems that they were not known even to the German high command with their fine intelligence services. The Soviet air force was a completely unknown quantity. Russia had not been particularly successful with her aircraft, and although the Rata single-seat fighter had been fairly widely commented upon, nothing faster or better than this had been heard of in Britain. Moreover the Soviet bombers that were known outside Soviet Russia were mostly clumsy machines of poor aerodynamic qualities and low performance. Russia had employed a number of American aeronautical engineers to help in the building up of her aircraft industry, but even these men did not seem able to assess the real air strength of the

Soviet Union. Before war broke out there had been, however, the remarkable long-range flights by Russian airmen in one of which a non-stop journey from Moscow to San Jacinto, California, had been made, the route running close to the North Pole. The aircraft in which these long flights were made might have attracted more technical attention and ought, perhaps, to have led to some realisation that Russia had made much air progress. It was a monoplane of exceptionally high aspect ratio, with integral wing-fuel tanks and a host of other important and advanced features and it proved that its range was exceptional for the date at which it was built. There were a few other hints that in Russia progress in aeronautics was being made, but they were not broad enough hints to impress themselves upon the intelligence organisations of other countries. When Germany attacked, therefore, there was a feeling in Britain that the Soviet air force would be unlikely to have anything to teach the Royal Air Force and that its tactical methods would probably show little innovation or ingeniousness. The idea that the Russian use of air might in the broadest and boldest outline be revelatory, might show a large grasp by the Soviet military leaders of the part air could and ought to play in large-scale warfare, was scarcely considered. It was thought that Britain and Germany knew more about the use of air in war than Russia. And here it must be interposed that the factor of date comes into the right assessment of the part that aviation should play in the broader pattern of war. In 1939 the part of aviation differed from that of 1943. Technical development had put up the striking power of most aircraft by giving them larger guns and heavier bombs. In addition there were more aircraft available and some of them had been developed in performance to suit certain tasks which had only called for treatment after war had broken out. There was also the gradual aeronautical education of the larger masses of people which was being brought about the war. As more and more people began to know what the aeroplane could do, so the demand to put the aeroplane to greater use in all operations grew in volume and vigour. There was, therefore, in June 1941, a certain right balance between air effort and ground effort in a great land battle and it was a balance which differed from that of 1939 and again from that of 1943. The Russian commanders, as the event proved, to the surprise of many British officers, saw with remarkable clearness how much aviation could do in the kind of war on which they were embarked and they also saw with remarkable clearness where the limitations on its powers were temporarily set.

The fighting in 1941, when the Russians were borne back, though

strongly resisting all the time, in 1942 when they regained ground but again lost it, and in 1943 when they began to go forward again, was of mountainous size. No battles of more gigantic figure had been fought before; the great 2,000 miles battle-line swayed and strained under the opposing impact of vast agglomerations of men with every conceivable machine. Clashes of tanks, crawling on one another in cohorts, and the surging rush and pause of infantry units occurred beneath a ruddy canopy of fire and shell. Artillery was used in powerful formations and at no point in the line did either side relax its vigilance or lower its pressure. Here and there the strength of one side increased over that of the other and the line bent. Instantly a redistribution of the troops took place and the situation was repaired. To look down, as it were, from a great height on this immense battlefield would have been to see a struggle of men and machine masses so large as to make an appreciable scar on the face of the globe. The human creatures were poured in from both sides and with them, protecting or tearing them, were the things of metal. Soft flesh and blood and hard iron and steel—each side had its compactum of hard and soft, surging on, retiring under dire pressure, fighting back, churning the ground and turning fertile fields into a morass of decomposing flesh and disintegrated machinery. And the Russians, with a fanaticism which took the Germans aback, fought whether they were in front of the German lines or behind them. The guerrillas stabbed and stabbed and although their little daggers were small when compared with the mighty engines arrayed in the front lines, they distracted the Germans' attention and made it harder for them to concentrate on their main task.

The Germans, in Russia, began by using their air force exactly as they had used it in France. They caused it to work with the army and to prepare the way for advances by army units. They used their Junkers 87 dive-bombers, their Heinkel 111 bombers and their Messerschmitt 109 fighters besides a number of other types. They did not indulge in much strategical bombing, though they did mount a number of raids on Moscow before they were near enough to the Russian capital to threaten it immediately. But in the main they kept their air force working with the army. The Russians were expected to do a good deal of strategical bombing, for the operations in Finland had suggested that it was their chosen method. In fact Finland had suggested that the Soviet Union might employ air power more independently than Britain. But when the great German attack came it soon became plain that the Russian commanders saw the risks of an undercurrent attack; they saw that if they devoted much of

their air strength to long-range strategic bombing, while the Germans devoted most of their air strength to giving immediate and close support to their army, the army, with its air assistance, might be able to come in underneath the Russian defences as it were, and to make headway. It is, after all, nothing other than the doctrine of concentration of force at the decisive point; the doctrine discussed by military writers through the ages, but working in the vertical instead of the horizontal plane. The Russians therefore welded their army and their air force together to form a wall against which the German army and air force had to hurl itself. The Russians allowed air to permeate and colour the fighting on the eastern front, but they did not allow air to go off and engage in battles all on its own. They wove air power in with land power. And this illustrated the mathematical quality of their thinking about war matters. They had avoided the pitfalls which others had fallen into or stumbled over, and they had made a good assessment of the power of aviation and of what it should be asked to do in the kind of war which was to be waged in their country and with the forces they had available. They had not been over impressed by the fine writing of General Douhet, nor had they gone to the other extreme of thinking that the aircraft was a long-range gun and nothing more. They had developed not only parachute troops to a high pitch of excellence, but they had also introduced some new things, the self-propelled bomb for example. This was used first, it seems (for even when war broke out the Russians retained their official reticence about what they were doing and what weapons they were using) from the Stormovik dive-bomber (I use the term employed by the Russians though its validity has been disputed), a single-engined robust aircraft, well armoured and designed primarily for making low-level attacks by bombs and machine-gun and cannon fire on opposing land formations. The self-propelled bomb, which has been called the rocket-bomb, is carried in the usual manner, but when it is launched the rocket mechanism is started and the bomb leaves the aircraft not only with the forward speed of the aircraft, but with, in addition, the impulsion given by the rocket which is a continuing impulsion. The result, according to the claims made, is improved aim and improved penetrative power, the bomb going faster for a given fall. Tactically the Russians also showed enterprise although the only aspect that it was possible to mention was that of ramming. At first the reports that Russian pilots had rammed enemy machines by intention were discounted. They were not believed until a large number of authenticated cases had been given. The

Soviet pilots had, undoubtedly, evolved a ramming technique which gave them a chance of escaping from their machine by parachute and even occasionally bringing their machine back in a damaged condition.

All these tactical and technical innovations, however, were subsidiary to the military intelligence with which the Soviet air force was disposed. It was not wasted on work that could have no immediate effect on the course of the battle. It was concentrated where the need was greatest. As the Royal Air Force had devoted itself mainly to air fighting in the Battle of Britain, so the Red Air Force devoted itself mainly to tactical work with the Red Army in the Battle of Russia. As the Soviet Union had accurately foreseen the course of political events prior to the outbreak of war and had acted solely to place itself in the best strategical positions, so when war came, it ignored the emotional influences which tended sometimes to obscure the clearer understanding of the power and limitations of the air in this year, 1941, and immediately achieved strategical and tactical dispositions which fitted the structure of war on the Eastern Front. Russia was revealed not only as a great power, but also as a considerable air power, capable of engineering advances and of a sound understanding of the problems and range of air strategy and tactics. Russia, by coming into the war, came into the world picture. This immense country had suffered in the past from its immensity. It had not become knit together so well as other countries by roads and railways. Had it seen that aviation could bring about that knitting together? Had it calculated, in the cold and mathematical manner it had calculated the chances of war and the methods of war, that the full employment of aviation as a cohesive agent would turn Russia from a country that was huge in size before it was anything else, to a country that was both huge in size and great in power? The emergence into the light of Russia as a great fighter and a great political and military thinker gave rise to many questionings and, here and there, to some anxieties. The Soviet Union as an air power, with a strong shield in its air forces and, behind that shield, with the strength derived and developed from the full opening up of the country by fast transport, all this seemed new and strange. Russia had never been thought of as fitting into the picture of a mechanised world. She seemed still to be primarily agricultural. But this was not a war of agriculture, though agriculture was playing its part; it was a war chiefly of mechanisms and in it Russia was showing herself in many ways ahead of other countries. If this had happened in war it was not going far to assume that it might be a prevalent condition in the peace to follow the war. Russia might, in a

world more knit by air travel, and composed of much larger agglomerations called states or commonwealths, Russia might, in this newer world, play a larger part than had been expected. The concept of the expanding community had to take into account the part that Russia would play. It is also part of the concept that air travel and transport enables large regions of natural but as yet unrealised wealth, to render their riches. By enabling the parts of a sea Empire to cohere and to work in a close consort of efficiency, air transport has its value to a scattered Commonwealth joined formerly by sea routes alone. By diminishing the time intervals between the components of such a sea Empire it strengthens that Empire and gives it a richer density. It does the same for a land Empire or land state of vast distances and remote horizons. Russia, no more than the British Empire, could remain unaffected in its essential biological progress, by the full development of air transport. Air transport, giving the communities the power to expand, gives them at the same time the power to merge into greater communities. Russia, before the coming of air transport was a loose collocation of parts. Air transport did not, when it first appeared, make any appreciable difference to the cohesion of those parts or, it follows, to the economic strength of Russia. Air transport during World War II was at an early stage of development, but it was at an important stage of self-revelation. The war forced the world to see its scope although that scope was not yet fully available. To develop Russia as an air empire or commonwealth or union of communities was an idea of the future and not of the present in 1943. But as the Russians had, with their mathematical way of thought, calculated the part that aviation would play in war, so they were calculating the part it would play in peace. They were noticing that it could make great Russia much greater by interlacing and strongly knitting its parts, by giving it all the advantages of its huge areas while removing their disadvantages. Vast tracts of land are fruitful to those who use them well; but they are themselves also a cause of difficulty if they spread, scatter and disperse the human effort applied to them. Concentration of effort is as much an economic, industrial or agricultural, as a military maxim. Russia, therefore, must have seen in 1943 that aviation offered her opportunities of a greater greatness; of a continuance into peace of the mighty feats she had proved herself capable of in war.

Here, therefore, there is confusion and complexity to the original thought and central theme of these notes; the theme of the expanding community, being compelled to expand when the means become available. For although every sign showed that this compulsion to expand exists and although every

stage of progress indicated that communities would reach out and take in other communities to form bigger aggregates directly the time-transport was available, yet there was in Russia and in China an already great community though one that had not yet enlisted the new form of transport to increase its greatness. It therefore seems a possibility that great states like the Soviet Union and China—but more especially the Soviet Union—were not at the stage when a reaching out to other communities and a joining with other communities in vaster commonwealths was demanded. They would still, it seemed, be able to utilise air transport for the stimulation of their internal growth and for the increase of their own cohesion rather than for reaching out abroad.

Here is a problem into which air power cannot theoretically be fitted as yet. Will Russia rapidly build up her own resources by using the powers of air transport and so produce a Soviet Union mightier than the Soviet Union which so gallantly and so well stood firm against the German attack of 1941? Or will she consent to the process of merging to which judging from the published remarks of their leading statesmen, both Britain and the United States of America were inclined by the time the war had run over four years? Soviet Russia, the enigma of the peace between the wars, stands as an enigma again when the glance is thrown forward to the peace following the wars. For this much is probable; that any mighty country that chose to stand out from the merging process, that sought to restrain the expansion of communities which is encouraged and made possible by the coming of air transport, would be checking a widespread and instinctive desire (I apologise for the word "instinctive," but I can find no other). And when such a check is imposed the pressures build up and again there must be war or its equivalent in cosmic disaster and destruction, to balance and resolve the opposing pressures. In short let the communities be retained in their states as those states were known in the period 1918-39, and the peoples will experience the urge to reach out and to spread. That urge will build up and become steadily more powerful as radio teaches each community about the other communities and as air transport, highly developed, puts each community within physical reach of the other communities. There is, if this argument has any validity, a need in communities to expand. Hold down that need by artificial means and the pressure rises, the urge becomes greater by being forcibly repressed, there is a passionate will to break the bonds and then there is war. Soviet Russia perhaps is the unknown and the unknowable to this generation. One day she will be known

and one day she will fit in with the greater agglomerations of states; but whether that time will be delayed and whether it will be brought about by some other cosmic cataclysm, is not distinguishable. The great Soviet Union is not easily read. Its mathematical outlook, its impersonality, its indifference to the sentimental trivia which sway the Anglo-Saxon communities; its resemblance to a machine, turning gently over in all form of pattern and design, in the manner planned and prepared, these are things which baffle the observer who has not himself made a study of the country. And those who have made such a study sometimes cling to the doctrine of simple power, with the communities dominated by the most powerful and not themselves responding to other impulses. Air war on the Russian front was only partial revelation. It illustrated the mathematical exactitude of the Soviet thought processes and its new-found ability in aeronautical engineering. It showed that the Russian commanders had a clear understanding of the manner in which air power permeated land power and must be regarded as coming within it; but it did not show what future aims were behind the impassive masks which the great Russian rulers and statesmen presented to the world. Premier Stalin seemed to be standing in everyone's mental picture of the great war leaders; but whereas the character of the other leaders; of President Roosevelt, of Mr. Winston Churchill, of Herr Hitler, of Signor Mussolini, were apprehended clearly enough to give some general hint of their modes of thought and action, no such apprehension of the character and inwardness of Premier Stalin was spread. He, like the country he led, was an enigma. As a war leader he may perhaps have gained by that mystery; but it did prevent any idea gaining ground, even in the vaguest and wildest terms, of the place Soviet Russia felt to be marked out for herself in the peace that was to follow the war. So when in 1942 and 1943 before the U-boat menace was fully affirmed, the perpetual presence of this drably uniformed, undecorated figure, with the black moustaches and the queer reticences of expression and speech, was felt. Many felt that Premier Stalin was the strongest personality of all the war leaders. His iron will had rung out in his calls to the Soviet people at the time of the battle before Moscow and again at the time of the heroic defence of Stalingrad. He bowed to no sentimental superstitions; he stood alone and cold in the face of the ravage of his country by the enemy, but planning his moves with an inhuman (in the strict sense) exactitude and mathematical inevitability. In the darkest days he had been there, saying little or nothing, but contriving to make every man and woman engaged in

the war continually conscious of his strange, hard, dark presence. Only once or twice did it seem that he was going to reveal himself more fully. When Mr. Winston Churchill flew to visit him in Moscow Premier Stalin gave a banquet which sounded to English ears an impossibly lavish and fantastic affair, with champagne flowing and caviare in abundance. The banquet was reported as having occupied half the night and as having called for the drinking of a large number of toasts. Premier Stalin, still in his drab, undecorated uniform, was represented as moving among his guests and acting as an almost genial host. Yet somehow the unbending of Premier Stalin still left him as enigmatic and inhuman (again it must be said that the term refers to actions) as ever, a strange enclosed figure to his friends, a dark centre of weaving will and deep forethought to his enemies. No more absorbing subject than the Soviet Union and its part in the war had ever been broached. But all that can be said has been said about the manner in which this great state regarded flying and we must turn now to another period of the war; to the operations which marked a change of balance in the world combatants and which suggested that the air war was yet to mount to a fury and scope not visualised even after three years and a half of fighting. We turn now to that astonishing feat of arms and organisation, the Allied landings in French North Africa.

CHAPTER XI

THE pace now quickens. The overture to the invasion of Sicily and of Italy accelerates towards its climax. The martial rhythm alters perceptibly and with the alteration there goes a fuller use of air power. In that the change follows the previous ones for, as the preceding chapters have sought to point out, every great crisis of war was accompanied by a modification or clarification of the use of air power in war. The war of 1939, or World War II, was a war of discovery; every stage of it laid bare some new aspect of the part that aircraft can play. Although the war of 1914-18 had introduced aircraft to war, the war that followed was the one that really began to distinguish air power and air limitations and to put opinion on a footing of experience. At the time of the great amphibious operations in the closing weeks of 1942, opinion about the part of the aeroplane in war was still divided. There were still those who imagined that it had "superseded" other weapons and that warships, for instance, were obsolete and tanks unnecessary where the aeroplanes were sufficiently numerous. Major Alexander de Seversky in the United States wrote in brilliantly stimulating but exaggerated manner in this vein. His views were later to receive the accolade of a Walt Disney film. He spoke of victory through air power and weighted all his claims down on the side of air power. His contributions to the subject were marred by their repeated claims for aircraft achievements that were at the time impracticable. Some of Major de Seversky's arguments, for instance, took in their stride a bombing aircraft range of 6,000 miles. Mr. H. E. Wimperis, who was formerly Director of Scientific Research at the Air Ministry and who had been concerned in aeronautical research for many years, produced a theoretical study of Major de Seversky's claims in which it was shown that, without any bomb load, the maximum range of bombing aircraft designed according to the best existing practice would be somewhat below Major de Seversky's figure. As the operation of a bomber without a bomb load is a negative activity the effect of Mr. Wimperis's calculations was to throw some doubt on the validity of the whole of Major de Seversky's argument, although Mr. Wimperis did point out that the argument was partly based on the construction of much larger aircraft than existing ones and that, with large increases in size, the position would become somewhat more

favourable. Nevertheless although Major de Seversky's arguments were based on thin technical grounds, they had their value in guiding thought along useful lines. Their fault really lay in their demand for the immediate use of aircraft for purposes they would not be able to fulfil for some years to come. It was pointed out, when the assessments of the air situation made by the Soviet Union were being discussed, that the power of the air was growing and the capacities of aircraft increasing year by year with the result that the correct use of aircraft in war during one year differed from the correct use the next year. The remarkable feature of the Russian appreciation of aviation lay in its correct adjustment of time and scope. The Russians did not expect from flying more than it could perform at the time they were using it. They did not underrate it or overrate it. They did not look too far forward or too far back. Major de Seversky foresaw (and no doubt foresaw correctly) the scope of aviation in the future, but he argued as if that scope had already been attained in the present. His skilfully written books and articles led to a body of opinion being formed in Britain which believed that aviation was not being used well and which argued that if aviation could do so much all on its own, the appropriations for land and sea forces should be reduced in favour of the air forces. In short this opinion was summarised in the phrase: Bombing can win the war. Many people believed that bombing could win the war. And they had as their supporter—though not in so many words—that powerful personality and great air leader, Air Chief Marshal Sir Arthur Harris, Commander-in-Chief of Bomber Command. Air Chief Marshal Harris made a number of public statements in which he emphasised in memorably harsh and direct phrases, the power of the bomb. Moreover he did not only talk; he acted. It is true to say that the world was astonished when he launched upon Cologne, on the 10th of May 1942, a raid in which a force of 1,130 bombing aircraft took part. It was still more astonished when, on the 1st of June in the same year, he mounted another attack, this time on the Ruhr, with 1,136 aircraft. On the 25th of June more than a thousand aircraft again went out to attack Germany, the target this time being Bremen. The losses in these three tremendous raids were heavy; they were 44, 35 and 52 aircraft. It was not known until much later that the raids had been possible only by calling on aircraft in the operational training units. But the raids were of historic importance for they represented the kind of raiding that was visualised by men like General Douhet, Major de Seversky and all those who believed that independent air action might win the war. They influenced the Prime

Minister's decision, in his capacity of Minister of Defence, to devote a larger proportion of the total national effort to the building of bombers. It is my view that those who believed that air action alone could win the war at this date, or any date, were mistaken; but my view is based not upon the conviction that aviation has too little strength; but on the conviction that it has too great strength. That seeming paradox will be further elucidated later on. Here all that need be said is that there were those who believed that aviation could win wars all on its own; there were those who believed that it should never be more than an auxiliary to land and sea power and there were those who believed that air power is bigger than bombing power, and that aviation by its nature and development could never be independent, but must permeate all other warlike action as it would eventually permeate and inform all peace action. Some said concentrate on aviation and drop everything else; some said drop aviation and concentrate on everything else; but some said aviation and everything else are one and indivisible. Aviation though omnipresent is not omnipotent.

It is necessary thus to try and sort out these views because they affected every step taken in permitting the Royal Navy to build up its Naval Air Services and Naval Air Equipment and every step taken to give the Army its glider regiment and its airborne divisions as well as every step taken to increase the striking power of the Royal Air Force itself. Every step was influenced by the balance of these thoughts and beliefs. The method of allowing all sides to put their points—as they did in the Press and in Parliament—was justified by the clarification of ideas which was gradually achieved. But nothing produced a greater clarification than the amphibious operations in French North Africa which were synchronised with the great drive westward from El Alamein of the Eighth Army under General Alexander and General Montgomery. These events cast a searchlight on the part air power could and should play at that time and gave a firmer indication than the enthusiastic claims of writers and speakers of what it would do in the future. Some reminder must be given of the outline of those amphibious operations. It was at 10 o'clock in the morning of the 23rd of October 1942 that the Eighth Army's offensive against the forces of Field Marshal Rommel at El Alamein began. Preparation had been by the Royal Air Force, the Royal Australian Air Force, the Fleet Air Arm, the South African Air Force, and the Desert Task Force of the United States Middle East Air Force supplemented by squadrons of the Fighting French air force. These air forces, when once the enemy had been forced

to retire, staged a furious and continuous onslaught on his retreating transport columns, the airmen setting up a succession of fresh records in the numbers of sorties made per squadron per day. And here I must interpose a flash back to the war of 1914-18 because it helps to indicate how the work of air forces goes to form a single developing picture and is not a sudden invention of the 1939 war. Great damage was done in the 1942 advance by the Allied air forces; but in September 1918 equally drastic results were obtained by the Royal Air Force also, curiously enough, in the Middle East. British airmen then caught three divisions of the retreating Turkish army in the narrow pass of the Wadi Fara gorge and wreaked great damage upon them. In 1942 events echoed those earlier achievements; the airmen of 1942 repeated the feats of their fathers nearly a quarter of a century before, in the same place and the same conditions. But in 1942 there was the subsequent retreat by the Axis forces beyond Tripoli to Tunisia and all this linked up in the allied strategical pattern with the amphibious operations in French North Africa. By the 16th of November General Montgomery's forces had taken the aerodrome at Martuba, 100 miles beyond Tobruk while in the month 23rd October to 23rd November thousands of aircraft sorties were made. It was during this period, on the 8th of November 1942, that the Allied landings were made in French North Africa. Covered by aircraft of the Royal Navy a vast convoy including transports of many shapes and sizes and carrying United States and British troops, moved into the Mediterranean and then simultaneous landings were made at several points along the coast. Fleet Air Arm Seafires, the deck flying version of the Spitfire, and Albacore torpedo carriers were used. Grumman Martlets also played their part in the fighter forces. Airborne forces made the journey of 1,500 miles from England to Oran, the aircraft used being Douglas C-47 transports. British parachute troops were dropped close to an important town in Tunisia and on the 10th and 11th of November airborne forces landed at Maison Blanche and captured Bône aerodrome. The United States parachute forces in this region were commanded by Lieutenant-Colonel Edson D. Raff, a New Yorker of remarkable and inspiring personality who had much to do with the full development of these forces by the American Army. Many astonishing stories were current about the work of airborne forces, but none more astonishing than the one which was published at the time of the landings which stated that Blida aerodrome had surrendered to a solitary Fleet Air Arm pilot who landed there in a Grumman Martlet. The point which has to be seized here, however, has to do with the fact that this

amphibious operation in North Africa, timed as it was to synchronise with the rising climax of the battle in the Western Desert, was the first major Allied operation in which air power played the part which, it is argued, should always be allotted in military activities, a part which also has its analogy in civil activities. Air power coloured and covered everything done during the landings. Airborne forces were employed, as well as land-based and ship-based aircraft of many kinds. The land and sea forces were, on this occasion, knit in with the air forces and the aim and ideal of the "balanced" force of all the arms displayed itself in full shape for the first time. But another thing about these operations marks them out from all others as indicating a notable advance in Allied strategic thought and Allied conceptions of the right employment of air power and this was the series of long-range raids by home-based heavy bombers on places in northern Italy. On the 24th of October eighty Avro Lancasters flew from England, 675 miles, to attack Milan in daylight with the loss of three aircraft, and their attack was immediately followed by a night raid on Milan. This dual attack on Milan followed a night raid on Genoa and was succeeded again by raids on Turin and Genoa, all made by home-based aircraft of Bomber Command.

Here was full and free realisation of the unity of military effort and of the manner in which air power must dovetail in with other kinds of power to produce maximum power. These attacks must be regarded as part of the operations in French North Africa and in Libya. The whole picture was brought for the first time (in Allied operations) within a single, simple frame. Long-range bombers employed their powers of strategical bombing not this time to hit at distant enemy objectives so much as to reach out to distant allied forces (if one may state the facts in an apparently confused manner) and lend them *tactical* aid on the battlefield by *strategical* bombing. That is the apparent feat they performed. The Lancasters flew out on a raid which took them the distance they would have flown if Berlin had been the target. But the target was in fact a part of Italy through which supplies were going to Field Marshal Rommel and to Axis forces in Sicily and Sardinia and in consequence Bomber Command was employing its range capabilities to reach out a helping hand to the Eighth Army in the east and the First Army and United States forces in the west rather than to reach out an avenging hand to hit at Germany in her own remote strongholds. May we see here a clearer appreciation of the power of bombing and of the correct manner of using air power? May we see a unification of effort bringing in all the arms in a team effort more closely co-ordinated than

any previous team effort? May we see the glimmer of understanding that air is not alone, but that air, land and sea are the indivisible trinity of military and civil power and that the air machine is merely a means and not an end in itself? In other words the North African amphibious operations were in fact three-element operations and they showed that the machine is made for man and not man for the machine. The aeroplane is there to be employed for giving aid everywhere and not for achieving spectacular but unrelated feats on its own. The effectiveness of the balanced force of all the arms, and of the knitted operations of air, sea and land, was proved on the 11th of November when the French forces in Algeria and Morocco capitulated. It must be recognised that the operations in North Africa—the landings in French North Africa, the advance across the Western Desert and the long-range support bombing by home-based aircraft—were the opening stage of the second phase of World War II. The first phase had consisted almost entirely of an expansion of the two main Axis partners, Germany and Japan. From their own centres they had extended in all directions, forming wider and wider concentric circles round themselves with the territories they had captured. But as they expanded, so their rate of progress diminished until about the middle of 1942 there were signs of dwindling power at both of the two huge perimeters reached by the main Axis powers; that centred on Germany and that centred on Japan. At this same moment the war power of the Allies was waxing and it was found possible to put some pressure on these perimeters at a few selected points, the Axis finding it progressively harder to hold their lines against this pressure. This applied in the Pacific zone where the operations in New Guinea were proceeding well and where the American and Australian forces were not only holding but here and there making small indentations in the vast Japanese perimeter and in the western zone where British and American forces were making indentations in the Western Desert and in the Mediterranean in general. The Mediterranean, then, was one of the first indentation points and the operations in North Africa were the start of a reversal of military fortunes.

It is right to look back on the position earlier in the war as a means of emphasising this division moment between the two phases. When Italy entered the war in June 1940 the Royal Air Force in Egypt had a force of forty Gladiator single-seat fighters of the biplane type, seventy Blenheim light bombers, twenty-five Bombay and Valentia troop carriers, twenty-four Lysander Army co-operation aircraft and ten Sunderland flying boats. Reserves for the Gladiators, Blenheims and Lysanders were 100 per cent.

That force, small and equipped with aircraft at least one step below the best of the period, had been adapted, modified, built up, augmented until in 1942 it was the most powerful air force outside any of the main battle arenas. But in addition the whole idea of air carrying had made headway and airborne troops were a part of the Allied armies, and aircraft for taking parachutists, arms and equipment with supplies of all kinds were in production on a large scale. Malta had in like fashion been transformed from a naval base almost entirely devoid of air strength, into a powerful air and naval base. All this country lay on the perimeter set out by Germany and here it was that the Allies prepared to make their first indentation upon it. The Allies had been developing long-range aircraft as much as they were able and had been weaving their air action more closely in with their sea and land action to place a constriction on the Axis perimeters followed by piercing movements at selected places. The war was conditioned by transport, but to a greater extent than before by air transport. As the expanding community is given scope and stimulus to expand by improvements in transport, so the warring nations were being given scope and stimulus to expand by the same means. The Axis stretched out more and more, but the Allies also stretched out and reached the Axis at its remotest strongholds. Bomber Command could come to the aid of the Eighth Army in Egypt without moving from its bases in Britain. Airborne troops could leap from England to Algiers in one jump by means of the transport machines. As communities expand and for similar reasons, so the war had expanded until the vast agglomerations found their perimeters in touch. Russia, the United States of America, the British Commonwealth of Nations; these had all reached out and extended their scope and power through transport. The Axis states sought to do the same and to stiffen their outlying defences with the aid of transport. A critical change had taken place in the war at the time of the Allied landings in French North Africa. The use of air as a merging and stiffening force had been accepted; the extreme views of those who wanted to see air working on its own almost without reference to land and sea and of those who wanted to see air tied to land and sea had at last moved towards full resolution. Air was seen as blood in the body, permeating and taking sustenance to every part, but not in itself complete or in any manner independent.

Before turning to the full and final interpretation of these scarifying events of World War II and showing how they are related to the whole pattern of life in a world of radio and air transport, some simple rehearsal of

the main facts that have emerged may be useful. A set of significant air operations has been assembled and each one has been discussed in its relationship to the wider issues. The thesis of the linkage between the world's communications and the pattern, political and strategical, of the world has been enunciated. "*La politique des Etats est dans leur géographie*" is the word of Napoleon. Here it is suggested that we can go farther and say that the size, status and politics of states arise from the interaction of their geography and transport and communications systems. In trying to demonstrate this the individual operations have been taken and examined according to the way they have influenced or indicated the progress of thought on this subject. Carrying is regarded as the basis of communities and it is held that the war forced this point upon the attention after a period in which it had been largely lost sight of. The first step was the sudden focusing of public attention upon the power of the air in the early stages of the war. Before this period there had been much lip service to aviation but little practical effort, little readiness as a nation to spend much time or money upon it. But the imminence of danger from the air taught more in the few seconds that the sirens wailed, than the months and years of argument before had been able to teach. But although the power of the air was then recognised in this direct manner, the way in which air transport must fit into the structure of war-making and peace-making was not even dimly realised. So the next stage after the early realisation of the power of the air was a series of lessons of mounting memorableness which gradually set into the minds of the people the understanding of air. Dunkirk drove home a feeling that something was seriously wrong with the general attitude towards air and with the manner in which it was treated by the Services, which, after all, was merely a reflection of the manner in which it was treated by the country at large. The relationship between air and sea came to be dimly appreciated. And the air battle of Britain drove home the lesson of England's dependence upon the sea/air position and no longer on the sea position alone. The radical influence of air upon Imperial strategy came into view. A time of confused but anxious thinking followed to be partly resolved by the enemy in his remarkable operation against Crete which is dealt with in Chapter VIII. This helped to clarify public ideas and Service ideas and to sweep away remaining uncertainties and misunderstandings. Meanwhile the United States had been developing air-sea power in the Pacific and had been applying theory successfully in practice. In fact for air-sea power the United States took first place, for air-land power the Soviet Union took

first place, and for air power alone Britain took first place during this first phase of World War II. At the opening of the second phase of World War II with the amphibious operations in French North Africa, the three strategical conceptions of air power were merging into the single, greater conception, with air permeating all; striking on its own, but also working as one with sea and with land. It was the doctrine of indivisibility enunciated many years ago by Brigadier-General William Mitchell of the United States Army, abandoned and forgotten afterwards, and then again seen in full and in detail as a result of a second large-scale war experience. It is not suggested that there had been suddenly a full revolution in thought and practice; but in the central direction there had been a full revolution in thought and practice and it had been brought about by the compulsion of events. The war in the air from 1939 to 1943 was a war of revelation and of instruction. A few of the revelatory and instructive incidents have been enumerated and it is now possible to turn to a plan which may embody all the new-found knowledge and make ready for the greater developments to come.

CHAPTER XII

NO claim to originality is made for the basic air plan which is to be outlined in this and the following chapter. It is the plan best enunciated by General William Mitchell, former assistant chief of the United States Air Force in his book, "Winged Defense," which bore the sub-title: "The Development and Possibilities of Modern Air Power—Economic and Military," and was published in New York about 1925. Mitchell enunciated the idea of the single fighting Service as a substitute for either the two-service or the three-service system. His idea was born from his experiences in France in 1917 when he was the first American officer to cross the lines in an aeroplane. After World War I he served as director of military aviation and assistant chief of the Air Service, as the titles went then, with the rank of Brigadier-General. His criticisms of American military policy caused him to be returned to the rank of Colonel, but he was later recognised everywhere as a pioneer and a prophet. His only fault lay in his inability, which he shared with other pioneers and prophets, to put forward and to support his ideas in the formal and ponderous manner which impresses those in high places. Mitchell flung out his ideas right and left, in bits and pieces, and then rushed to demonstrate them. He himself staged the historic tests in Chesapeake Bay in 1923 in which aircraft bombed a number of obsolete warships and showed their power, giving appropriate bomb sizes, to sink large, armoured vessels. This kind of wild and whirling personal effort did not meet with the approval of the solemn theorists and the tradition-bound staff officers. They had little difficulty in throwing ridicule upon Mitchell's generous and open efforts to press upon them his bright ideas. In this conflict between Mitchell and the embedded bureaucrats, in the Services and outside them, a human comedy was played which has been iterated again and again since the dawn of history. On one side a young, bright, enthusiastic officer, bursting with his vision of air power, impatiently bearing down on objectors, himself tearing about the country uttering what were regarded as military and naval heresies, gaining, the public ear and—at the same time—earning the private dislike and distrust of the military hierarchy. It is no discredit to the traditional officers that they were opposed to General Mitchell and to his ideas of air power. Many young men trumpet forth new ideas and become virulently active in

publicising them only in the end to be found wanting. The ideas of the young and unorthodox are often inferior in practical merit to the ideas of the traditional and elderly. Experience teaches the elderly to avoid some of the pitfalls into which the young enthusiast runs at full tilt. It is not, therefore, to the discredit of the conventionalists that they held back from Mitchell's ideas. Those ideas might have been just another example of over-enthusiasm and under-experience. And it is true that Mitchell overstated his case. It is only necessary to recall his restless, urgent, generous character to know that he would never state a case carefully and tight-lipped, restricting his statements like a Minister replying to a question in Parliament. His book itself contains contradictions. At one moment he is drawing up a careful schedule of organisational progress, at the next he is sweeping ahead in vast claims for the omnipotence of aviation. But all the time it is clear that Mitchell had the vision that brings together ideas and events and starts a new thing. He permitted himself to be borne along at break-neck speed on the exuberance of his own prophetic vision.

It is right to take some of the statements made in his book; but before doing so it may be mentioned parenthetically that the book contains an astonishing piece of tactical prophecy. General Mitchell includes a diagram illustrating the method to be employed by aircraft when attacking a hostile fleet in the day-time. In almost every particular this diagram represents the methods actually employed by the Japanese when their aircraft sank the *Prince of Wales* and the *Repulse* off the Malayan peninsular. Perhaps the Japanese learnt more from General Mitchell than the English or the Americans. At any rate the Japanese attack went according to the book—a book written sixteen years before. And now for a few relevant quotations from "Winged Defense." In the Preface Mitchell says: "We should have a single Department of National Defense and under it a Department of Aeronautics, Department of the Army and Department of the Navy. The view of the air must be heard in the national councils on an equal basis with those of the Army and Navy." Later he writes: "The armed services of a nation are the most conservative elements in its whole makeup. To begin with, they antedate the governments themselves, because all governments have been brought into being by great popular upheavals which have found expression in military forces. The traditions among all the armed services are much older than any government, more conservative than any department of government, and more sure to build on a foundation that they are certain of rather than to take any chances of making a mistake. As they have changed

so little in their methods and ways of conducting war for so many centuries, they always look back to find a precedent for everything that is done. Hindenburg looked back to Hannibal's battle of Cannae, and made his dispositions to fight the Russians at Tannenberg. Napoleon studied the campaigns of Alexander the Great and Genghis Khan, the Mongol. The navies drew their inspiration from the battle of Actium in the time of the Romans and the sea fight of Trafalgar." Near the end of the book, when General Mitchell is giving his conclusions, he says: "The time has passed when any one service can be thrown off to work out its own salvation without respect to the others, as has been the case very largely in the past with the armies and navies. Air, land and water must be hitched together under one general command and direction to provide for an efficient defense."

Except that it would seem better to employ the word "war" where Mitchell employed the word "defense" and to call his "Department of National Defense" a Ministry of War (not to be confused with the War Office which is concerned solely with the Army), Mitchell's general conclusions are valid to-day. But before looking at the distance we have still to go before we can be said to have absorbed Mitchell's theory and are ready to put it into practice, one further quotation must be made as showing the extraordinary directness of vision with which Mitchell contemplated the power of aircraft even though at the time he was writing their powers were far from fully developed. With the lessons of Crete in mind the following words sound as if they were written in 1943 instead of in 1925. "Air power," Mitchell writes, "can hold and organise small islands in a manner which has been entirely impossible heretofore. These can be supplied by other aircraft, or by submarines, with everything that is necessary." Crete was captured and supplied by aircraft, Malta was supplied by submarines while the Axis powers held the coast of North Africa from Tripolitania to Egypt. General Mitchell was a prophet of air power; but he was more than that; he was a prophet of the organisation and the administrative structure into which air power can fit with land and sea power.

Look now at the broad pattern of the organisations employed by the great nations at war in 1943. Great Britain had the three-Service system. There were separate Ministries for the three Services; the Admiralty, the War Office and the Air Ministry. Under each of those Ministries there was a similar organisation for the devolution of responsibility. The Air Council, the Air Staff, the Commands, the Groups, the Wings, the Squadrons, and the Flights formed, in the broadest sense, the tree of administrative and

operational control and had their parallels in the other two Services. The Air Council had some ten or twelve members each one with his own set of responsibilities. The President of the Air Council was the Secretary of State for Air at the time and the Vice-President was the Parliamentary Under-Secretary of State for Air. Then came the Chief of the Air Staff, and after that the Members for such things as Personnel, Supply and Organisation, Development and Production and Training. Civil Aviation came under a separate head and had a Director General. The Air Staff comprised a Chief of the Air Staff, who was also, as has been mentioned, a Member of the Air Council, a Vice-Chief, various Assistant Chiefs and officers specialising in branches of air work such as operations and intelligence. For a time there was no Deputy Chief of Air Staff, but this post was re-established in August 1943. This structural tree has been approved if not hallowed by time and experience and forms the basic pattern of most military Services. When there were two such structures, co-existing though largely independent of one another, the scheme was shown to work well. It still worked well in Great Britain when, in 1918, the three-Service system was introduced and the Royal Flying Corps, which had been a branch of the Army, and the Royal Naval Air Service which had been a branch of the Navy, were merged to form the Royal Air Force, a third Service, junior to the other two, but independent of them. Each of these Services was an efficient entity so far as organisational and administrative structure was concerned. Each of them employed the same structure as the comparable organisations of most other countries. Each found by experience that the structure was strong yet elastic and that it was suited to cope not only with the elaborations of modern war, but also with the improvisations and improvisation is a test of administrative structure. In these three co-existent Services, then Britain had something which approached the plan outlined by General Mitchell. In one respect, however, there was a difference from this plan. In the Mitchell design there was a Ministry of Defence or a Department of Defence, within which came all three Services, co-existent and co-equal. Nothing of that kind existed in Britain during the period that has been reviewed. Britain's Ministry of Defence, under the Prime Minister's chairmanship was a totally different thing. In Britain there were the three Services and each one had its own department of state or ministry. Here, if our arguments are correct, lay the source of the weaknesses in the use of air which the war, step by step, exposed. Here was the reason why there were uncertainties about the part

that air ought to play, with one side over-stating its powers and scope, and the other under-stating them. Here was the reason for the continuance of inter-Service jealousies and for inequalities in the claims of the Services upon the aircraft manufacturers. Here was the reason for the curious apathy of the Royal Navy towards its own Fleet Air Arm and here was the reason—if our arguments bear weight—for the backwardness of the Army in the development of parachutists and other airborne forces. "It must be allowed," writes F. O. Miksche in his book, "Paratroops," "that the accurate appreciation and proper use of new weapons was not the Allies' strongest point in the first phases of the present war. The only High Command which can count on success is one which is prepared to concern itself as keenly with technical as with strategical and tactical problems." The reason for the backwardness of the Allies in appreciating new weapons must be attributed in some part to the structure of the British three-Service system. That system had great attractions. It had the merit of clear-cut reasoning, one Service for one element. It had the merit of giving the newest weapon the opportunities for development which exist when the treatment of it comes within the responsibility of a new and young service. Yet the "High Command" (and we must recognise that the term itself is nebulous in relation to the Allies) did not seem to show the fullest appreciation of the air weapon. It did not seem to show the appreciation which the German High Command showed. Although, therefore, the three-Service system was fundamentally part of what General Mitchell asked for and what many people with a belief in air power thought to be right, it yet did not bring with it that fuller appreciation of the power of the air or that greater imaginative foresight in the use of the air that was needed. Looking back over the war operations which have been discussed, we see that Britain showed expertness in the independent use of air, but inexpertness in the co-operative use of air until the work by the forces in the Middle East had built up an appropriate technique. Let it be put this way: that the three-Service system provided three fine and competent Services; that each of those Services showed the highest skill when its actions were considered independently; but that when two or more Services came to work together their results were not equal to what would have been expected from the sum of their efforts. General Mitchell, fanatic for air, enthusiast and prophet, had called for a scheme to give air power full scope, but he had seen that the scheme should be linked with that for unleashing the power of land and sea and that the three things come all within the purview of defence or war. Major de Seversky, speaking

at a much later date and with the full knowledge of what had been achieved and what had fallen short in World War II to guide him, called for air and yet more air and seemed to forget altogether the other two Services. The earlier writer, in the submission of the present author, was the sounder. In short, enthusiasm for air must not allow air to branch out on its own as if self-sufficient and omnipotent. The day may come when air will be much larger in its scope than now; but even if it manages at some remote future date to supersede the sea and to do everything that sea power can do with equal or greater efficiency, it will still have to call upon the land for the final resolution of its cadences. The man standing on earth is the central point of war and peace and nothing can dispense with him. A war cannot, therefore, be won by air alone. There is always, at some stage in the proceedings, that man standing on earth. No devices or developments can get away from him entirely and at all times. The great air battle involving whirling multitudes of flashing wings is but a prelude, an overture (when rightly regarded) to the humble walker and stander who plants his feet on some few square inches of ground and proclaims his presence. In late years the office chair has been greatly exalted. The office chair, with defensive and well dug-in desk before it, is the symbol of the paper background of existence and therefore partly the symbol of power. Yet neither desk nor office chair has the validity of the man standing on earth. All power, including air power, serves that man. Here, perhaps, was the fault in the organisation of the British three-Service system; that it did not take enough account of ultimate purposes and tended to allow each of the three Services to fend and to fight for itself and by itself. Contrasted was the fault of the two-Service system wherein air was not given its full scope to serve at all. In the two-Service system the tendency was sometimes, though not always, to make the air subservient not to the man standing on earth, but to the other two Services and so to create an artificial scaffold not suited to the support of the greater issues, nor to bear the weight of the growing power of the air.

Gradually as the war proceeded, some understanding, vague at first, of this state of affairs emerged. The call for aeroplanes and yet more aeroplanes had been heard by the people and they had forced it upon the notice of those in authority. Those leaders, being men of intelligence and of merit, sought to see and to understand. They groped desperately after the truth as the battle went against us. They saw the need to be sure of the correct use of air power by the time the Allies had built up that power to the fullest extent

permitted by their productive resources. They groped, therefore, for the truth. And among their efforts to reach it was their establishment of a chain of responsibilities from the War Cabinet, outwards and downwards, though the three Services. To set this out a White Paper was issued by the Government, dealing with the organisation for joint planning. At this time the term "joint" was intended to refer to inter-Service planning and not to planning as between members of the United Nations. The White Paper laid out the scheme whereby the Chiefs of Staff Committee, presided over by the Chief of the Imperial General Staff and having within it the Chief of the Air Staff and the First Sea Lord, provided for joint planning at the highest level. There then branched out the Committee of the Vice-Chiefs of Staff and various other committees. Here, it may be thought—and indeed this was seemingly the view of the Government at the time—there was adequate machinery to ensure that the fullest co-operation was secured between the three Services. Here was an organisation which enabled all points to be thoroughly thrashed out and sorted and for each Service to have its own say. The machinery, when examined, could obviously go a long way towards that end. Only the events of war, which brook no prevarications between the theory and the practice, could have shown clearly that something was still amiss in the machinery for producing the fullest collaboration. Those events have been mentioned, but it is necessary to return to some of their results. First of all there was the placing of the Coastal Command of the Royal Air Force within the operational responsibility of the Admiralty. This was largely the outcome of the success achieved by enemy submarines against Allied shipping. Then there was the formation of the first airborne division of the British Army and with it the Glider Regiment. Then, about the end of 1942 and the beginning of 1943, there was the public agitation, culminating in an acrimonious debate in the House of Lords, about the equipment and facilities of the Fleet Air Arm of the Royal Navy with the appointment of Rear-Admiral D. W. Boyd to be Chief of Naval Equipment and of Rear-Admiral R. H. Portal to be Assistant Chief of the Naval Staff (Air). This arrangement was announced by the Admiralty on the 22nd of January 1943 and it preceded a great and valiant effort to improve the equipment of the Fleet Air Arm and generally to advance the ideas and the practice of Naval air. Errors had been recognised and attempts made to ensure that they should not be repeated. The Royal Air Force had stretched out its protective canopies to sea and land forces and had studied to cover sea and land operations and at the same time

the Army had been given the right to develop an air side and the Navy had been given greater scope in the development of its air side.

All these things demonstrated a willingness to learn on the part of those in high positions and determination on their part to eliminate as quickly as possible all the faults that the battles of the war revealed. Britain stuck to her three-Service system and tried to blur the margins between the Services by giving the Army a touch of air and the Navy a touch of air and by seeing that the Royal Air Force extended its activities also to right and left in the direction of the Army and the Navy. But although these measures improved the power of Great Britain and set her armaments to work more effectively, there still appeared to be something wrong, something slightly muddled about these arrangements. Perhaps it was the very fact that the marginal spaces between air and land and air and sea had been so filled up and so emphasised that made the main structure appear unbalanced. There had been, in brief, a piling of complexity upon complexity in order to reach a solution to a fundamentally simple problem. We have to face this difficulty as a critic; that by 1943 Britain had so modified, added to and improved the three-Service structure, that most of the faults which had arisen through insufficient or improper use of air had been or were in process of being cured. Those Ministers and Service officers who had laboured so well to secure this end might well feel themselves unjustly accused by critics who still insisted that air power had not been correctly fitted into the picture. They might well feel that the critics were guilty of criticising for the sake of criticising and without just cause. They might feel that they had seen and cured the troubles that had beset the British forces earlier in the war and that, by their exertions, they had found the answers to the early questions and put air in its rightful place. It must be admitted that the Ministers and Service officers had done great things and had striven nobly to cure the faults that war experience had revealed. But it must also be stated that those who see air as all-pervasive and who believe in the three-dimensional military continuum, had to regard the cures as a species of patchwork. The holes and ravelled places were hunted down with exemplary patience and patched with the finest workmanship and the fullest care. Nothing can be said to suggest that the War Cabinet or the Chiefs of Staff failed in appreciation or in action. But the patched article, however well the patching may have been done, is still patched and cannot compare in strength and homogeneity with the freshly made garment, designed as one, executed as one, with all parts balanced and woven according to the original pattern.

We have, then, by 1943 the excellent patchwork created by the efforts of those charged with the higher direction of the war in Britain. We still have the need for a fresh garment and the need remains equally urgent for peace or war. Before turning to that fresh garment we have to look for a moment at the might-have-beens.

Chief of the might-have-beens, and a thing which the British people may have cause to regret for generations to come, was the Navy-Air continuum. Had the Royal Navy, the guardian of England, protector of the Empire, nourisher of the Empire's commerce and prosperity and basic arbiter of Imperial strategy, had the Royal Navy thrown up in the years after the war of 1914-18 an inspired officer who would have welded air and sea and brought them together in harmonious co-operation on the largest pattern, then it is conceivable that Britain would have moved by gradual progress instead of by harsh change, into the newer world. The people of Britain have put their trust in the Royal Navy for many years, not because there is some mysterious seamanlike quality in them, not because they "love" the sea; but because the compulsion of geography has forced the Navy upon them as their first guide, protector and friend. That is why the Royal Navy is without superior among the navies of the world. It held the confidence and the trust of the nation and it felt its real value to the whole of the British Commonwealth. It had a *real* duty to do and the prosperity and existence of Britain as a separate country depended upon it. This real need for naval protection arises from the dependence of the British Commonwealth for its riches and for its life upon the sea routes of the world. The Navy was picked out by the conformation of the land masses of the globe to play a large part in the lives of every British person. In 1914 the Navy had that trust. Naval officers and ratings were held in the highest esteem. They were honoured and indeed loved because of this deep understanding that they were the givers of life to all in the country. In 1939 the Navy held just as high a position in public estimation. Its exploits brought a louder acclaim from the populace than anything the Army or the Air Force could do. "The Navy's Here" was a statement which, uttered by the rescued prisoners of the *Altmark* in that amazing boarding exploit by British destroyer men, held in it everything that the word British could possibly mean and chimed and echoed in the hearts of the cockney slum-dweller who had never seen the sea as well as in the hearts of those who lived by the sea. That is the fundamental point to seize in regarding this poignant might-have-been. Had the Royal Navy profited by this absolute trust and

estimation, had it seen more clearly what air could do and how air would affect sea matters, and had it then pressed continuously and strongly in the years between the two wars, for full and powerful air strength, a logical and simple solution might have been achieved. Air might have come under Admiralty. The great carrying service, the great communications service (for trade went and still goes by the sea routes), would then have extended its scope but without going outside its avowed, traditional and nationally accepted purpose.

Look more closely on this might-have-been. The Navy having the full confidence of a country which owed its prosperity, its power, its existence to the sea, could have built up a Naval air arm as an integral part of the Royal Navy and would have been better placed than the Army or the Royal Air Force itself to obtain Treasury support for such action. Britain has always been more generous to the Navy than to any other Service for the same reason that it has always put its confidence in the Navy. Had the Navy pressed upon the public a case for a full air side; had it demanded loudly and insistently air development proceeding with sea development, had it demanded air personnel as well as sea personnel; had it taken an active part in the technical side of air development, there is not much doubt that Britain would have been fundamentally stronger in 1939 than she was. Although the German air attack on Britain might have been less effectively countered than it was; it is almost certain that the war on the seas, the battle of the Atlantic, the battle for the Mediterranean, the battle in the Far East, would have gone better. If the amounts of money voted by Parliament for the Royal Navy and the Royal Air Force in the years between the wars had been put together and the Royal Navy had been charged with ensuring the air defences of these islands as it had always been charged with ensuring the sea defences; had the Royal Navy been charged furthermore with the air protection of the sea routes and communications as it had always been charged with their sea protection, it is at least a probability that Britain would have been stronger in the aggregate than she was. Her Army would have been woefully ill-supported and might have been slightly worse off than it was during the fighting in France in the early stages of the war. But in the elements of battle essential to the survival of Britain as a country, Britain might well have been better off than she was. It was the submarine in 1943 that gave cause for anxiety as it did in 1917. It was the problem of shipping that cropped up with more and more insistence and which assumed a more and more menacing aspect as the months of war passed. Had the Navy

been responsible for air and had the Navy at all times had to look after its own air, it is a reasonable guess that the war at sea might have been waged with greater success than it was during those first three years. The Royal Navy could have obtained a mandate to provide for the air defence of Britain for that would merely have been an extension of its age-old responsibilities and would have fallen in the same line as those responsibilities. The Navy had always been responsible for the carrying strategy and the carrying foundations of the British Commonwealth and air power was really within the scope of carrying strategy. It is true—and this may be one reason no Naval officer-prophet arose—that air-carrying up to 1939 had dealt with such small loads relative to sea carrying that to persons accustomed to dealing with ships, those loads may have seemed completely negligible. It may have been for this reason that the fundamental place of air carrying in the Imperial strategy had failed to receive full recognition. At any rate no officer in the Royal Navy in the years between the wars saw clearly and made known forcibly enough the fundamental relationships between air and sea and between sea carrying and air carrying and therefore between sea strategy and air strategy. The prophet did not arise.

Instead of a prophet, those who spoke in public about air power and sea power were normally engaged in sterile controversies about whether the aircraft should rightly be looked on as a long-range gun and nothing else. There was a school of Army and Navy thought that used to argue at all times that an aircraft must be looked on as a long-range gun. They seemed to forget that a gun (except at the Circus) is not capable of conveying people from one place to another, or goods. They seemed to forget that there was always that man standing on the earth on his feet that had to be considered and that the gun could only destroy such a man whereas the aircraft—like the ship—could move him from one place to another and take him up from one piece of earth and put him down on another. The sea-air prophet did not arise. No great Naval officer exhibited air vision and the foresight which can bring about great changes and great developments. Those who were not seeking to prove that the aircraft had not threatened the utility of the capital ship, were thinking in miniature terms of air power, as a small adjunct to sea power. The grander conception of air-sea power did not arise. Yet how easily it might have arisen! How straightforward now seems the process of reasoning whereby any competent strategist or well-versed historian of British affairs might have fallen upon the greater truth and brought about a new Service well grown from the fine roots of the Royal

Navy and comprising the true air-sea balance! In the years between the wars the Royal Navy lost a great opportunity. It maintained its fine traditions, it kept up the high level of its courage, skill and devotion to duty; but it did not look farther and wider at the immense developments which were being set in motion by the swift development of the aeroplane. There were Naval officers who repeatedly asserted that the merging of the Royal Naval Air Service with the Royal Flying Corps in 1918 had been an error. It was their constant effort that brought about, in 1937, the re-emergence of the Fleet Air Arm as an entirely Naval arm. But even they did not see the whole picture; even they were not appreciative of the power and scope of aviation and of the speed with which it would grow. To those with a sense of history it will always remain a regret that the Royal Navy did not seize upon the basic facts affecting its responsibilities as guardian of the British Isles and protector of the sea routes to press its full claims for air. The poor quality of Naval aircraft may perhaps be traced to the dim realisation by the Navy that something which ought to have been and might have been its own, was the province of another Service. It can hardly be supposed that the Board of Admiralty attended to affairs of a Fleet Air Arm composed largely of personnel of the Royal Air Force and equipped with aircraft by the Air Ministry with the same diligence and enthusiasm it gave to affairs touching the Royal Navy itself. And in 1937 that legacy of indifference to air was to hold up for months the full appreciation of the work that was needed to develop sea-air power to the fullest extent. It was one of Rear-Admiral Boyd's first efforts, after he had been appointed Fifth Sea Lord in charge of Naval air equipment in 1943, to emphasise to all concerned that the Fleet Air Arm was an integral part of the Royal Navy and not a separate force stuck on to the Royal Navy. So at last the truer view prevailed and air and sea came together as they might have come together much earlier and on a much bigger scale. It is one of the great pities of the past that the nation with the greatest naval traditions and with the greatest navy should have failed to produce the force its strategy required when it required it, that is an integrated sea-air force. However the day is past when such a step could have been taken. Now the Royal Navy has its Fleet Air Arm or Naval Air Service just as the Army is beginning to develop its air branch.

No matter what the Army had produced in the way of officers with air vision, it would never have been able to build up a powerful integral air force. The reason has nothing to do with the abilities or far-sightedness

of the officers and men, but simply that Britain in time of peace neglects her Army, and refuses to provide it with more than a bare minimum of Treasury support. The Army in peace has neither the public support nor the Government support to branch out on new developments on a large scale. It was a part of the Army, the Royal Flying Corps, that created some of the fine traditions, afterwards so nobly carried on by the Royal Air Force. But that was in the days when flying was in its infancy. There were few machines and few pilots in the entire world at the time the Royal Flying Corps came into existence and the range of development and experiment was well within the scope of a small and financially ill-supported Service. There is, then, no might-have-been to be noticed on the Army side. When the Royal Flying Corps disappeared there was no imperative strategical, self-protective need that it should be revived. Imperial strategy had nothing to dictate in the matter; the concept of land war with air taking a part faded altogether from the picture. The Army was able, gently and with what really amounted to full public support, to forget about the air and to leave all that to the Royal Air Force. Nevertheless there were things about the Royal Flying Corps which deserve notice as we move towards some attempt to re-create a logical force for coping with the three-dimensional military continuum which is modern war and for coping with the transport aspects of both war and peace. The Royal Flying Corps had a striking individuality. That is not only the opinion of those who served in it, but of many members of the public with no direct interest in it, historical or other. Out of the Army there arose a very unusual corps, having its own attitude towards its duties and its own, efficient, way of performing them. On the aerodromes of France in 1914-18 there were astonishing agglomerations of officers from all the regiments of the British Army. The variety of uniforms was such that the casual observer might have had cause for supposing that *esprit de corps* would be entirely unattainable with such a mixed force. It appeared to be a hotch-potch of different people and their behaviour was anything but "smart and soldierly." Yet out of these mixtures of men and regiments and methods and manners, there did arise a body which was endowed with as high a morale (and to forestall the quibblers I again interpose that I prefer to spell it that way for purpose of differentiation) as any that has ever fought. The Royal Flying Corps then adopted and gradually began to wear its special and distinctive uniform; the double-breasted tunic without any buttons showing, the breeches and field boots. The uniform was said to

have been designed to suit the new thing of flying. It was kept free of all external buttons and hooks and the like so as to make it convenient for working in the narrow space of an aeroplane cockpit without getting caught up on anything and the closed neck to the tunic, with no tie-collar combination, was to allow nothing for the air stream to catch. The field-service type cap was chosen because this could be folded and placed on or under the seat without taking up room or being crushed. Altogether the theory which was said to lie behind the unusual R.F.C. uniform was ingenious if not strictly in accord with the facts of flight. Most of those who wore it, however, did find it a practical uniform for all kinds of air duties. It is most difficult for one who served in the Royal Flying Corps and who identified himself with it body and soul, to see the whole thing objectively. But it must be conceded that the Royal Flying Corps achieved for the Army something of what the Navy might have achieved later on on full scale. The air-land force which was created in 1914-18 may be said to have been a model in miniature for what the much greater and more powerful sea-air force might have been in the years that followed. But for the reasons outlined, there was no hope of the Army retaining its own air force when peace came. The Army then almost at once returned to the partial oblivion in which the British public keeps it locked away during the days of peace and no calls by Army officers for an Army air force would have been heeded. The Royal Flying Corps, in 1918, disappeared never to reappear. In 1943 the Army was moving towards some air arm of its own with its airborne divisions and glider regiments and the like; but as a fighting force the Army had little chance of reviving the Royal Flying Corps. It goes, therefore, into history as a fine body which might have been finer still had Britain been a land instead of a sea power.

The might-have-beens, therefore, are two; either the Navy and the Army might have been permitted to keep their own air arms and to develop them just as they had been doing during the war of 1914-18 and right up to the time when one of those persons with an itch to change things came upon the scene and prevailed upon the Government of the day to create the Royal Air Force. The alternative was for the Royal Navy to have taken over all air power as being the prime carrying Service and the Service upon which the whole of Imperial strategy centres. Neither of these courses was taken. The Royal Flying Corps was taken from the Army and the Royal Naval Air Service was taken from the Navy to form the Royal Air Force. And to many this seemed to be that simple, logical and centrally strong

solution to the air problem at the time. Here were the three Services working in their three respective elements. It was foreseen that there would be marginal cases just as there had always been. Were there not the Royal Marines to illustrate how ships had to carry soldiers? But in the main the idea did appear to have that simplicity and that strength of simplicity which main elements in organisational structure should have. In brief, then, all schemes fell short of the scheme roughly propounded by General Mitchell. But even that scheme demands the special modifications that time and experience can give it. It must take in the carrying side of the air more fully than anything previously considered necessary because a new understanding of the carrying powers of aircraft has come about and because those powers have been increased. It is known to-day for instance that the cost per ton-mile is not the only measure of transport values. Yet such used to be the universal yard-stick. Because aircraft could not offer a cost per ton-mile within range of vehicles like the cargo vessel or the train, they were regarded by many leading industrialists as being incapable of playing a big part in the transport of the future. In this a development similar to that undergone by physics since the introduction of the Einstein approach occurred. An additional factor, not previously thought to affect the observations, is suddenly brought into the picture and shown to influence all the other factors; this is time. Cost per ton-mile is an incomplete index. Cost per ton-mile-hour is the index that matters in modern life. In the years before World War II began the cargoes of the aircraft working on the main regular routes included works of art and bar gold and bullion. Works of art found that air transport was best for them not so much because they are in a desperate hurry to move from one museum to another, or from one connoisseur to another, but because they are less liable to damage in transit for they are handled less and are on their way for a much shorter time. Bar gold and bullion go by air to save the insurance by reducing the time of passage. Cost per ton-mile, therefore, is not a measure of the economic efficiency of a vehicle. The time factor must always be taken into account. The consequence is that air carrying at once moves up to a much more favourable position in world affairs. It has to be considered just as sea carrying is considered in Imperial strategy and it has to be noticed in any scheme for the organisation of the fighting forces. Again at the time General Mitchell put forth his ideas the scope of aircraft for conveying land forces from one place to another, for supplying them and for carrying their equipment was not fully foreseen. The forecast

about the use of aircraft for operations against islands has been quoted, but the sort of air troop transport work; the carriage of light land vehicles, and guns that was employed in the fighting in New Guinea by the United States and Australian forces was not foreseen. Clearly a wider scope must be granted to the triple organisation than was guessed even by the far-seeing General Mitchell. The two-Service system had not proved adequate to bring in air in its rightful place and to the fullest extent. The three-Service system had concentrated air overmuch and starved the collaterals; it had tended to group all aircraft into a central air force and to leave the Army and the Navy inadequately equipped. We may turn now to consider the single-Service system broadly outlined by General Mitchell as it might appear when re-designed to conform to modern knowledge and modern conditions.

CHAPTER XIII

TWO conflicting arrangements of the national fighting services and of the national mercantile transport services will have emerged from the foregoing pages if the facts have been displayed in the right order and with the right emphasis. The one conception is of the fighting and the mercantile transport services divided up in accordance with the media in which they work; the other is of the fighting and mercantile transport services formed as a single comprehensive body with sub-divisions arranged to accord more with the organisational structure than with the media in which they work.

The proposal here put forward leans more towards the second concept, that of the larger and more comprehensive body, than to the former; but although some pioneers have made suggestions which are on the way towards it, none of them has set out a complete scheme as a basis for detail discussion. One reason no such scheme has been propounded before is that the fundamental linkage between carriage and the community has not been accepted. That linkage was propounded in the early pages of this book. It was propounded with diffidence for the biological influences which establish it can only be guessed at by the present writer. But whether the idea of the community forced by influences over which it has no control to expand as soon as and up to the limit of the means of expansion available is right or wrong, it provides a good foundation for the creation of a logical structure for transport and communications organisation in both peace and war. One of the lessons of the war of 1939 was a lesson of scale. Herr Hitler gained many of his early successes because he looked on the operations to come on a larger scale than his opponents. The world gasped again and again at the vastness of his far-ranging strategy. The Allied countries in the early stage of the war, and, indeed, until the moment chosen here to set a period to the considerations, the beginning of the great amphibious operation in the Mediterranean, were always looking at things which were too small and their enemies were gaining because they were looking always at events and movements and combinations at least one size larger. May it be that the connection between the expanding community and the means of expansion has escaped fuller notice in the past because it involves size considerations beyond the ordinary? If it be accepted as true, for instance, it follows that

the country or "state," as it was known in 1939, must fade away and be replaced by a larger social organism in the future. It follows that the commonwealth of larger and larger size must replace the collection of small states. It follows that, unless new measures are taken to prevent it, the war of 1939 must eventually be followed by a yet bigger war in which larger agglomerations will struggle for the mastery.

Before launching into a hazardous and difficult attempt to outline a transport structure for peace and war, it is worth considering what is meant by these increases in the size of communities or administrative or other organisations. It does not necessarily mean that more and more power comes into fewer and fewer hands. If it did the acceptance of the theory of the expanding community and its appropriate organisational and operative structure would bring with it dangers of dissolution and decay. On this point a communication from John Graham Kerr which appeared in *Nature* for February 1942 is worthy of note. "Perhaps the most striking feature in the evolution of animal organisms is their advancement in size from small microbes to the relatively large creatures familiar in the animal world of to-day. This onward progress is a normal feature of evolution. It brings with it increased efficiency, increased power, increased speed or movement. But it also brings with it the seeds of decay and death. The geological record of evolution is littered with the remains of great powerful creatures which have become extinct while their smaller, feebler contemporaries have survived. The increase in size has in fact been attainable only by a corresponding increase in complexity or organisation, involving the development of an ever greater multiplicity of parts, an ever greater sensitiveness to impressions from without, an ever greater centralisation of control both over normal activities and over the appropriate reactions to emergencies."

If that is accepted as a true statement of the generality of evolutionary processes—and it can hardly be questioned—it may well apply on the larger scale of the community as well as on the smaller scale of the individual creature. There is a resemblance between the evolutionary processes throughout a wide range of sizes. The state has been growing and increasing the complexity of its organisation and its sensitiveness to impressions from without. There is, therefore, danger not only of greater wars, but also of dissolution as well as opportunity for progress in size increases and the danger arises in part from the very fact of size increase. It can, however, and the point is made by the writer just quoted, be met by the process of

delegation. There must be the large, central, governing body—for that is the inevitable consequence of growth—but it can delegate its authority to smaller or local bodies.

Apply these ideas to the organisational structure of the fighting forces and it follows that there should be the big, central governing body and the small bodies to which authority is largely delegated. The tree of responsibility therefore becomes clear. It begins with the Minister of State who is the central responsible person for the prosecution of war when war occurs. He has within his department the whole of the operational machine including the Navy, the Army and the Air Force and his authority is delegated to those three co-equal Services. It would not, however, be possible to achieve this larger and more logical grouping without cutting away from past methods. There would have to be a renaming of the Services. That is a difficult thing to propose. The present author was much saddened when the force in which he was serving was bidden by the country to abandon its name of Royal Flying Corps. He had, as has been mentioned, so identified himself with that name that it seemed that a part of his life was being cut away from him and the new name of Royal Air Force seemed (in that remote and youthful period) to be utterly hateful. It took some years of service in the new force before that psychological trauma had healed. It would be fully as difficult and as disturbing and distasteful to those serving in them to change the names of the three existing fighting forces. Yet there would seem to be no other way of achieving the necessary flexibility and strength of organisation and the logical arrangement of the fighting forces without that change. In short the officers and men of all three Services would be named as belonging to one Service, their particular functions being marked out by their uniforms and by their badges. Lord Gorell, in an article which appeared about 1942, put forth some of the reasons why a single fighting Service might be preferable either to the three-Service system such as is used by Britain or the two-Service system such as is used by the United States of America. In his remarks he suggested that the new Service should be called the King's Service. It is not here intended to arouse prejudice or to excite discussion on a point of that order; but it is clear that a single central all-embracing name could be devised without difficulty. When it is considered that the final purpose of the members of all the fighting forces is the same, there should be no logical objection to the adoption of a single name for them. The objections, therefore, would be traditionalist and conservative and they might be overcome by appropriately

couched arguments. The creation of a single fighting force would, if so desired, permit the retention of the three different colours for the uniforms and would allow the same badges and other insignia to be used. There need be, therefore, no radical break from existing patterns. The single fighting force, the King's Service, coming under a single Minister of War, would have within it and forming it the three branches; the Sea Branch, the Land Branch and the Air Branch.

When the creation of a single Ministry of Defence was being discussed during the administrations preceding Mr. Churchill's, the objection was often heard—indeed it was advanced more than once in the House of Commons—that the task of Minister would be so great that no single man would be capable of coping with it. Such an argument neglects the essentials of the delegated administrative system. The Minister holds the responsibility but his powers of delegating duties are almost unlimited. Moreover, and this is the stronger point, the appointment of a single Minister of War would eliminate those discreditable manœuvres whereby in the past one Ministry sought to pass to another those responsibilities which were not clearly defined as its own. Some of the failures of British arms during the early stage of the war were due to nothing other than shortage of equipment and smallness of force; but some were also in part due to the vagueness of the definitions of responsibility between the Admiralty, the War Office and the Air Ministry. It would hardly have been possible for those unhappy incidents to have occurred wherein soldiers, who had been left without air cover, expressed openly and fiercely their contempt for their comrades of the Royal Air Force, if all had been members of a single fighting service, bound together under a single political head, coming under the same King's Regulations, receiving the same treatment as to pay, pensions and the rest and working together with a single aim. It might be argued that if the three different uniforms were preserved there would still be jealousies and disputes and there is, on those grounds, a case for a single uniform as there is for a single Service. But the three separate uniforms would be less likely to lead to invidious comparisons if they merely represented—as shoulder badges might do—the different *branches* in which the individuals were working. The single Ministry of War (not to be confused with the existing War Office which is not really a war office for it concerns itself with but one part of war) would bring within itself all officers and men who join together to serve their country in the fighting line. They would be the disciplined and trained fighting forces.

The advantages of such a three-in-one system are not confined to organisation and administration. They cover also supply and research. There may well have been some justification for the criticism that the research which was done for each of the three great war departments, Admiralty, War office and Air Ministry, was done too much in watertight compartments so that the Services did not each of them reap the full benefits of the research being conducted for the others. Technological research is so evenly spread over the equipment of the three Services and the subjects tend to merge and to overlap to such an extent that there is an obvious weakness in any system which keeps the research and scientific workers engaged in dealing with one department's problem separate from those dealing with another. The position was, of course, complicated by the creation of the Ministry of Production, the Ministry of Supply and the Ministry of Aircraft Production. It is here submitted that the creation of these ministries was right in detail but wrong in principle. The delegation of authority and of responsibility would demand that a single fighting service would be fed by a number of supply branches; but these would not be separate ministries. There would be one Ministry of Production and Supply. It would have its branches dealing with aircraft, tanks, guns and other warlike stores but it would have only one single, central political head on which the main responsibilities would converge. The expedient of the separate ministries was a war expedient which came about as a result of the feeling that the tasks were growing too large for the existing ministries. It was thought that aircraft production had assumed such overwhelming importance that the Air Ministry could not be relied upon to devote the necessary attention to it. And that was largely true; but it was true only because the main structure was inadequate for its purpose. Had there been no Air Ministry, but only a single central Ministry of War and a single central Ministry of Production and Supply, then the administrative and organisational structure would have been basically strong and logically suited to its functions. And within the Ministry of Production and Supply, the three co-equal branches, for sea, land and air, would be well placed to meet the needs of the three parallel branches of the fighting force, yet they would also be well placed for the fullest collaboration and the freest exchange of information.

Here then are the main girders, as they might be called, upon which could be built a logically arranged and well balanced political, administrative and organisational structure for the fighting forces: a single Ministry of War containing co-equal branches of sea, land and air, and a single

Ministry of Production and Supply containing co-equal branches for sea, land and air. The next step in the creation of this structure would be concerned at the next lower level of the staffs of the Services and here we turn back to the Government White Paper giving the organisation for Joint Planning. Here is, in effect, a structure, forced into existence by the pressing needs of war, which has almost the appearance of having been created as part of a single fighting force such as has been outlined. In the Joint Chiefs of Staff Committee and the Joint Vice-Chiefs of Staff Committee there is the essence of the war staff which could wield the weapons in a harmonised manner. And it is to be noted that a Joint Chiefs of Staff Committee of this kind would receive a valuable easing of its duties by the creation of the proposed single Ministry and single fighting force. For then although the individuals would be as expert in their specialised duties, they would not be torn by conflicting loyalties or worried by jealousies and invidious distinctions. The Chief of the Air Branch would never have to consider his attitude, for instance, in relation to the concentration of his bombing formations upon submarine bases as it would be affected by any work to the same ends that the Admiralty might have in hand. The supply of aircraft for bombing squadrons would not be a matter of relative prestige with the Fleet Air Arm or with the Army's airborne divisions; it would be a matter solely of squeezing the greatest military effect for a given quantity of raw materials and man-hours of labour. In short the disturbing small thoughts that must inevitably have interfered with a concentrated consideration of every problem on the part of the Chiefs of Staff would be removed if they were all of them the members of one and the same Service under one and the same political head. At every step in the scale we have to notice some advantage that would be gained by the creation of a single fighting force. In the Royal Air Force, for instance, the numbers of men who take part in operations relative to the total number of men in the force is small. Moreover many of the ground crews and others whose duty keeps them on the ground, are persons of high technical skill and have, therefore, been through a training which is often long and arduous and is totally different from that which the members of the air crews have been through. The consequence is that a small part of the Royal Air Force endures the strain of battle and when members of that small part find that age or the repeated psychological wounds that are the inevitable outcome of operations, terminate their period of first-class operational efficiency, they can find no tasks within their own Service which will enable them to retain a position comparable in trust and

importance with that they have previously held. There has been from time to time a real problem in finding means for spreading the war strain evenly within the Royal Air Force. The ground worker, highly skilled and much trained, cannot be used in the air, the air worker, when his resistance shows signs of weakening, cannot be found a job of high responsibility on the ground. With a single Service this difficulty would be overcome for the variety of tasks to which members could be directed would be vastly increased. Moreover there is the added advantage that those officers and men who show a desire for change during the course of their service, could be given opportunities for it. At present in order to obtain a full liaison between the Army and the Royal Air Force there is some such change. Army officers can be seconded to the Royal Air Force where they can be put upon flying duties. They then wear air force uniform, but retain their places in the Army list and eventually return to the Army. This arrangement is a sign that the three-Service system is not structurally sound. There would be no need for such elaborate exchange methods if there were but one Service. Nor would the slightly ludicrous juggling with procedure and the rest be any longer required. The Royal Air Force Regiment, for instance, wears khaki with Royal Air Force rank badges and Royal Air Force blue walking-out dress. Hundreds of such examples could be quoted. They show the sincere groping of those in authority for a solution to the marginal problems of collaboration. But such weird jugglings would not be needed with the cleaner, more streamlined structure of the single Service. At every level in the scale of duties, then, the single Service system containing within it and as part of it the three elemental branches dealing with sea, land and air would gain over any other system so far tried.

The principle of the organisational structure depending from a single, central political head is applicable to the fighting Services. But the fighting Services of the British Commonwealth of Nations and of any future similar groupings of equal or greater size are created upon a strategical basis which takes in transport as one of its chief ingredients. It has been noted that the strategy of the British Empire was based upon sea communications and that as air transport gains in importance and scope relative to sea transport, so the strategy of the British Commonwealth must change too and must be based more and more upon a combination of sea and air transport. In short the structure for the fighting Services is powerfully, indeed, decisively influenced by transport. Transport determines its shape and the constitution of the forces involved. It follows directly that the kind of organisation which

is well suited to the fighting forces, or rather to the single fighting force with its three branches for sea, air and land, would also provide or might provide a model for the organisation which is well suited to the commercial intercourse and transportation of peace-time.

Again the war gives a guide to events though an incomplete one and one not widely interpreted as yet. During the peace which preceded World War II a Ministry of Transport had been created in England largely because of the rapid growth of road transport. Its name, Ministry of Transport, was not entirely correct for in fact it concerned itself almost entirely with one form of transport and left other forms alone. Shipping did not come within its scope nor did railway transport. But when war came the fact forced itself upon the notice that it was desirable to have a single, central political head to the whole organisation of transport. Hence the Ministry of War Transport was created as a result of the pressure of war. It seems, now, a little strange that the compulsion to form a logically constructed machine for dealing with transport should have been recognised and accepted while the desirability of forming a logically constructive administrative and organisational machine for dealing with the fighting forces was deferred. At any rate the war produced a larger advance in the treatment of transport than in the treatment of the fighting forces. With the exception of the Civil Aviation Directorate at the Air Ministry, it brought all forms of transport together under a single political head, and, so doing, it gave a clue to the action that ought to be taken in the future. In other words the contention is here put forward that as there should be a single fighting Service containing within it the co-equal branches for sea and land and air, and as there should be a single Ministry for production and supply containing within it the parallel departments or sections for sea and land and air, so there should be a single Ministry of Transport containing within it the three parallel departments for sea and land and air.

It has to be accepted that the administrative and organisational structure favoured by Britain at the outbreak of war, with numerous ministries taking responsibilities for numerous activities but without in the distribution of these responsibilities any sane or simple or logical guiding influence, was as nearly crazy as could be. It was the outcome of the patriotic and honest efforts of numerous statesmen to provide an organisational framework for something that was growing much faster than their ideas. As in the early stages of the war there was a failure on the part of those in high places to see things on a sufficiently large scale. As they sought with much pains

and with no little ingeniousness to meet the changing conditions of life and work, they looked only at the details and forgot the whole, grand picture. The vast surge of energy released and stoked up by the tremendous advances in transport and communications escaped them as they tried frantically to deal with that troublesome vehicle the private motor-car. They failed to observe the manner in which ideas were passing between countries through radio communication as they failed to assess at their full value the effects of aviation and the possibilities it provided for fuller and wider human interchanges. So the steps taken to meet the new conditions brought about by the application of radio and aviation were piecemeal and illogical. They were the hesitant and random gestures of a well-meaning but worried man seeking to set straight a situation that had got beyond him. No sign of a coherent pattern on the larger scale was given. No sign appeared that the wider implications of the increasing scope of communication and travel had been grasped and were being allowed to guide events. The Ministry of Transport engaged—before the war—in heated controversies about the thirty miles an hour speed limit in built-up areas and about the institution of pedestrians crossing places. It was harried on account of the number of road casualties and it was criticised on a large number of other subjects; but no one arose to point out that it was a small and ill-considered mechanism, working within a much larger and entirely unconsidered mechanism. The statesmen—well intentioned, anxious, eager, saw events on the small scale and failed altogether to perceive that something bigger than a national or an Empire revolution was being brought about by the wider introduction of air carrying and radio communications. Had they seen this grand plan of the expanding community, enlarging itself automatically as the means became available, they would have seen also the oneness of transport and would have appreciated that land, sea and air transport were all transport, as land, sea and air fighting forces were all fighting forces. In both instances the trinity of purpose was apparent and that should have compelled the trinity of organisation and administration. To administer air transport separately and differently from sea or from rail transport was like administering the vegetables differently from the meat so that the noted English dish of meat and two veg. would be impossible and the finalisation of the dishes would scarcely ever synchronise. War, therefore, showed not only the oneness of the fighting forces; but through that revelation it showed the oneness of transport. We approach, therefore, the greater synthesis of war and peace; of the strategy of world war and the strategy of world transport. We begin,

perhaps, to notice a newer holism in which technological effort and achievement is indivisible from the sociological as from the military development of communities; we begin to observe that where there is technological advance, there will be sociological and commercial development also. There is sadness in the thought that hovers over this reading of the situation. For if it be true that the community expands not because it has decided that expansion will give it greater happiness, but because it is compelled to expand just as a living thing is compelled to grow, the degree of free choice in the world of the future would be limited. The Atlantic Charter and the other statements of objectives, as well as such plans as that outlined in the friendly Beveridge Report of 1943, are the outward expression of inward thoughts, but the attainment of the objectives and the completion of the plans may not be within the control of human beings. The point has come out more than once when consideration is being given to transport development in the future. We may look back to the period of intensive motoring development as one example. Motorists motored partly in order to give themselves the opportunity of getting out of cities and streets "where houses thick and sewers annoy the air." But as motorists multiplied so it became more and more difficult for them to achieve this purpose. They began to go about in droves, blindly seeking the unspoilt open country which they themselves were despoiling. The period of railway development was much the same. The first instinct of the populace was to resist the development of the railway just as the first instinct was to resist the introduction of repetition machinery in the factories. Some towns and villages even tried to refuse to allow railway stations to be erected within their boundaries. It was the delusion that the railway would bring within reach unspoilt country that finally helped it on. People who had clustered in communities had as people nearly always do, spoilt the country within their immediate reach. Human beings are dirty livers. They ruin and wreck the vicinity of their habitation. They scatter about their houses and streets; they raze the woods and forests, destroy animal life, shut the earth away from the sky with asphalt or concrete or brick. Then they discover that something is missing from their lives. They are not precise as to what it is but usually they begin to feel a desire to see green fields and trees again and they turn to transport. Now there is nothing inherently in aviation which suggests that the cycle will in any way be altered. Aviation allows the communities of the world to make one more attempt to reach out into that enticing Arcadia which they have been so industrious to destroy in their own vicinity. It

offers them another bright picture of beauty in the distance. It suggests to them that by flying fast and far they will reach it. Is that picture a mirage? When the railways presented it—offering the smaller communities of that time the seeming chance to get clear of their contiguous squalor and to reach the brighter lands beyond the hills—the hands of the communities all reached out, like a vast concourse in prayer, towards the better land which transport would let them reach. The necessary transport developments occur; the community pours out from its place of habitation to find the promised land, only to get there at the same time as millions of others so that there is no distinguishable difference between the promised land and the original point of departure. If one looks at aviation as a step in transport, and if one assumes that it will have the same general results, though on a larger scale, as previous transport developments, then the defeatist theory of human purpose is supported. It does, then, appear that human beings are bent on plundering the earth that gave them life and that they are employing every scrap of knowledge they can wring from the universe to increase their plunder. There is no cosmic concept of duty and responsibility in them. There is not even a world concept of duty and responsibility. This failing is seen most clearly in those reformers who work so hard and so long to improve the lot of the poor. They are actuated by the highest motives of humanity and charity. They devote their lives to seeking to help those less lucky than themselves. Often they adopt of their own free will a mode of life much harder than they need because of their humanitarian desire to avoid enjoying benefits which are shut off by circumstances from their brethren. But they are like the commanders of the three British fighting Services at the outset of World War II in that they fail to integrate their benign purposes and aspirations with the harder pattern of material life. They see poverty and wish to relieve it and in the intensity of their interest in this detail process, they overlook the larger pattern of life. They do not recognise, in their humanitarian zeal, the life cycle within which all activities are forced to come. When in the early part of 1943 there were loud cries for development work on civil air transport the question of what purpose, what precise objective was aimed at was neglected. The debates both in the House of Lords and the House of Commons all started from the premise that faster transport must in itself be a blessing. No one questioned seriously the philosophical implications. No one sought to relate faster transport and farther-ranging transport to human needs and to the cycle of existence. It was generally accepted that faster and farther-ranging transport

must in itself be good. The belief that it was advisable for Britain to do everything possible to put herself in a strong aeronautical position was not questioned. Yet that belief, to those who study it, does seem to have the feeblest basis if past experience is a guide. The sum of human happiness does not appear susceptible of increase through faster, farther-ranging transport.

In this book the premise is not that there is an advance in human happiness to be had for developing air transport; but simply that humanity is compelled to acquire knowledge and to apply it, and that communities like human beings individually, have within them the urge to grow so that they are compelled by their character and physiological, psychological structure, to take every opportunity that occurs to grow and to expand. I am not competent to deal with the philosophical implications. But it is necessary for me to state that I do not "advocate" a more active commercial aviation. I do not set out what I believe to be improved organisational structures for dealing with commercial and military aviation because I think that improving the efficiency of these things will increase the sum of human happiness. I regard progress in these directions as being compelled not chosen. It may be partly within our power to control the growth of living things, but the power is as yet very limited. Perhaps the day will come when full control will be learned. Then it may be that control of the growth of communities will likewise be controlled. As yet there is no sign of any vestige of such control. It is not, of course, simply a matter of population, but also of spread and of territory occupied. In these respects there is no effective control exercised by human beings over their collective fate. So my premise is the undeniable urge to grow, for communities as for other living things. From that it follows that the use of transport must be adapted as an instrument of growth. And from that again it follows that there must be administrative and organisational machinery for releasing to the fullest extent aviation's growth-promoting impetus. If the country that fails to make use of aviation as a medium of growth is liable to fail and to decay, if we believe, as we are bound to do, that we have a right to as great a share of the world's riches as any other community, then we must develop aviation because aviation is one of the means of acquiring those riches and setting them to our service. I do not, therefore, submit these suggestions as philosophically sound, but merely as materialistically and mechanically sound. We are forced to use aviation or go down in the scale of material wealth; if we are forced to use aviation we must so organise the authorities administering it that they give it its full chance to develop to the greatest possible extent.

The summary of the proposals made here is this: for the military employment of aviation there is needed a single, central ministry of war taking in aviation as one of three co-equal branches and so being free to develop it in any desired direction which shall produce useful results in battle; for the civil employment of aviation there is needed a parallel single, central ministry of transport taking in aviation as one of three co-equal branches and so being free to develop it in any desired direction which shall produce useful results in commerce and communication.

Those who have been enthusiastic believers in the power of aviation have in the past unwittingly worked against its interests, by trying to set it apart from other activities and by claiming that it can work independently to the fullest effect. In fact aviation will reach full stature only as a thing which permeates all other activities and ministers to land and sea transport, land and sea fighting, land and sea commerce. Aviation, in brief, is too big to be confined within a single cage, even though a gilded one. Great liberties have been taken in setting out these thoughts with existing ideas and existing practice. In the next chapter still greater liberties will be taken for in it an attempt is made to forecast the kind of air equipment that might fulfil the conditions of that greater aviation which is predicated in the organisation outlined.

CHAPTER XIV

REORGANISATION of the administrative, political and technological structure responsible for the encouragement and employment of aviation in all spheres of work brings with it opportunities for the fresh orientation of aircraft design. The more clearly the purposes to which aircraft are to be put are stated, the fuller the specifications for them can be. The absence of good Fleet Air Arm aircraft in the Royal Navy and the absence of first-class troop transport aircraft in the British Army in 1942 were the end result of the three-Service system with its focusing of attention upon Air Force needs partly to the exclusion of the air needs of the Navy and of the Army. The advantage of that focusing was found in the excellent fighters. There was no administrative body in a position to weigh impartially what was required or to sort out without prejudice the demands of the different Services. The consequence was that the Service charged with air duties naturally obtained a strong priority in all aircraft appropriations over the other two Services. With the proposed single, central Ministry of War, war aircraft would be sorted out according to their duties at the highest level and there would be a good chance of the building up of a balanced force, including a balanced air force. It has already been mentioned that special advantages accrued to Britain at the time of the great air battles of 1940-41 through the manner in which the (wrong) conception of the independent air force had thrust forward the development of the fighter types of machine. But that advantage must be considered a stroke of fortune rather than the outcome of far-sighted planning. We have always to recognise that the unbalanced enthusiasts who claimed that air could do everything everywhere and said that there was no further need for a Navy or an Army, did a great service to Britain, though at the same time their theories were proved to be incomplete and in some respects mistaken. In the early stages great errors and great eccentricities can occur without fatal results. Neither side in 1939 was too certain about the exact status and the exact range of duties of the air force in modern war. The German theory was, for the fighting on land, nearer the truth than the British theory. The United States theory was nearer for the sea. But the British theory was nearer the truth for fighting in the air. It was only the compulsion of events which finally sorted out these ideas and set them in their true order and true proportions. So

now the attempt must be made to look on the new political and administrative structure, with the single, central Ministry of War, and to draw conclusions about the types of aircraft it would want to put into commission.

The remark has been made that the aim and object of all warlike operations is the man standing with his feet upon the earth. In all considerations of tactics and technics that man standing with his feet set upon the earth must be held firmly in mind as the final purpose. To bomb a city to a rubble heap is a purposeless proceeding unless the immediate sequel is the occupation of the remains of the city by infantry soldiers and by others living there and working there. In the pre-war police work on the North West Frontier the Royal Air Force undertook some historic and extremely important operations against recalcitrant tribes. It used the bomb—though sparingly and never without giving prior warning—and it reduced many such tribes to obedience to British rule simply by air action. Britain did not take over their villages by means of punitive expeditions by land forces. She sent her air force to threaten and, if necessary, to strike. From these remarkably interesting operations the term “control without occupation” emerged. It was a catch-phrase holding some truth and some falsehood. For in those North-West Frontier operations there was, in fact, a form of occupation by the political officers. They were the men, standing with their feet upon the earth, for whom (in the final analysis) all the air force activity was undertaken. They did occupy the towns and villages and without such occupation it would have been impossible to tell how far British rule was being obeyed. In these minor operations of the pre-war period the Royal Air Force was the cause of saving large sums of money and many lives. Instead of long drawn out, expensive and bloody punitive campaigns by land forces, the air units could act swiftly and effectively. So “control without occupation” became a sort of aviation enthusiast’s war cry and it was suggested that the aim of the Allies should be to apply control without occupation to Germany. But the Frontier tribes were unarmed in the air and so the air arm could do much more against them for a given expenditure of men, machines and munitions than against a powerful enemy with a large air force like Germany. Moreover, as has been said, the North-West Frontier villages were not really controlled without being occupied. There was always occupation; there was always the man standing with his feet upon the earth, even if he was alone, acting as a political officer for the British Government. “Control without occupation” therefore is a term which should be treated with caution. Here we measure the kind of aircraft that are needed for the waging of effective

war. It is convenient to work backwards from the man standing with his two feet on the earth.

That man can be transported to the place to be occupied by land, sea or air. The best way of transporting him because the quickest and the most direct and the only global no-change route, is by air. By air that man, who represents the final mark of success in war, can be taken to any part of the globe from any other part without change of vehicle, and on a Great Circle course (which is the shortest course) in the least time. He will travel at least ten times as quickly as by ship and at least five times as quickly as by land. He will require no harbours to be prepared for his reception and no railway lines or stations or roads. He has already in existence his track from anywhere to everywhere and he can, by one means or another, descend from his aircraft at any spot he may wish. It follows that the best way of conveying the ultimate occupying force to the place it is to occupy is by air. That brings us to the first type of aircraft to be considered in the scale of types; the transport machine. It is to carry men first of all and second their equipment and supplies. The carrying side of the air arm must be as complete as possible and must be able not only to deposit the men who stand on their feet on the earth, to symbolise and to practice occupation of conquered territory, but also to feed and sustain them there. The military carrying aircraft is doing a task not far removed from that done by the civil carrying aircraft and must therefore resemble it. Its size is the first consideration and next its air performance. Since the air carrier must be ready to do all carrying work and must aim to be able to transport every load from largest to smallest, it must range in size up to the extremes of largeness. The air carrier which can take a tank is the common criterion of weight lifting. But there are numerous loads of large size to be considered, among them the larger guns and transport vehicles, ammunition of all calibres and bombs, machinery, spare engines, water, oil, petrol and in fact all kinds of military and warlike stores. In 1943 there were in service with the Allied air forces a number of sound transport aircraft. Some of them, as already mentioned, were employed for the amphibious operations in North Africa. There were the Douglas series of machines, including the four-engined Skymaster, and there were the Curtiss Commando. The Lockheed Lodestar was in service and the Lockheed Constellation, a much bigger aircraft, was at this time well advanced in development. Some attempt had been made by the United States factories to use for these carriers non-strategic materials and one of the machines in which this policy seemed temporarily successful was the Curtiss

Caravan. The Consolidated Liberator Express was the transport version of the Liberator bomber. Great Britain at this time had few transport land-planes. The Armstrong Whitworth Ensign was still in service with the Air Transport Auxiliary but only to a negligible extent. The Avro York was a development of the Avro Lancaster. It had a large transport type fuselage replacing the bomber type fuselage. But the York was primarily intended as an experiment in adapting a big bomber to commercial transport. It was not an aircraft primarily designed for military carrying nor even primarily modified for this purpose. Among the large marine air carriers there were at this time a number of the Short flying boats which had been introduced on the British Empire services before the outbreak of war, some Boeing Clippers used by Pan-American Airways and the Vought-Sikorsky Excalibur. The very large 70-ton Martin Mars was an ocean reconnaissance flying boat in its original form though the modification of it which was canvassed by Mr. Henry Kaiser, the American ship-builder, as being well suited to the Allied air-carrying needs, was to have been a transport machine. The Germans were using still their Junkers 52, three-engined machines for this type had been in continuous production since before the war and many of them were available. This aircraft, not in itself of any special merit, had taken its place in history just as the Junkers 87 dive-bomber had done, not through any intrinsic aerodynamic merit, but because both types had pioneered in their own fields. Nothing much can be learned from the Junkers 52 as a troop and supplies carrier, although during the first three years of war this machine was the most prominent of all in undertaking these duties. But the American aircraft which began operating extensively at the time of the North African landings were in all respects more advanced as aircraft. We may set out the requirements for the air carrier thus:

- (1) Good disposable load to gross weight ratio.
- (2) Good "transport" handling qualities.
- (3) Big loading hatches, with, if possible, a low-level loading floor.
- (4) Provision for a degree of self-maintenance.

It will be noticed that in essentials the troop transport and supplies carrying machine is like an ordinary commercial air liner or cargo machine except that a great toughness in maintenance qualities is called for so that the machine is as little sensitive as may be to aerodrome conditions. And here we must discuss one feature bearing upon the merits of every type in

the list, a feature which is often discussed but is sometimes insufficiently closely related to operational scope. This feature is landing and taking-off qualities. In the search for speed in the air designers have progressively increased the wing loadings of military and of civil aircraft. In the war of 1914-18 wing loadings ranged from about 6 lb. to the square foot to 12 or 15. In the war of 1939 they ranged from about 20 to 60. One result of increased wing loading is the ability to fly faster on a given power; but another result is an increase in landing speed and—other things remaining equal—in taking-off speed with in addition an increase in landing run and in taking-off run. During the first three years of the war of 1939 there was a progressive increase in the demands made for landing and taking-off space for large aircraft. Runways were increased in length yet there was always a demand for more and more space. The big bombers of the four-engined classes based on Britain found that they needed a considerable run when all their equipment was working correctly but when they returned from a raid, for example, with hydraulic equipment shot away and the wing flaps out of action, they demanded runs of remarkable length in order to get down safely. The distance went up from one mile to two miles and then to three miles. This relationship between the advances in the performance of the big aircraft and their aerodrome requirements is of supreme interest and importance to both commercial and military aircraft. It must be noted in detail and fully appreciated before the next step is taken in this survey of the aircraft that would meet the needs of a rationalised military and civil aviation of the future. The point is this; that the faster and quicker climbing an aircraft, in general, the greater its sensitiveness to aerodrome space and surface. The ultra-fast machine demands an enormous landing and taking-off area of smooth surface. But the fact that aerodrome requirements become more elaborate as performance rises, means that in military work the high performance machine must be based farther from the fighting front than the low performance machine, while in civil work it means that the high performance machine is suited to the long distance trunk routes, where it can work between large, fully established aerodromes with all modern refinements, but that the low performance machine is still needed for the short hauls. And it will be noticed at once that these essential relationships apply equally to civil transport machines and to military transport machines; to fighters and to bombers. We can express the point differently. The faster the aircraft the farther its base must be from its true operating centre of gravity. In other words the ultra-high-speed commercial transport aircraft

must work from an aerodrome far removed from the cities which it is intended to serve; the ultra-high-speed fighter must work from an aerodrome far removed from the fighting front where it is to challenge the enemy to combat. It is a problem of proportion which ought to be continuously present in the minds of all aircraft operators, civil and military, and of all aircraft designers and those responsible for sending out specifications to which designs must conform. The point has been partly made in these pages already in the discussion on aircraft carriers. Aircraft which were worked from carrier decks were, until 1943, of much inferior performance to aircraft which were worked from land aerodromes. The landing and taking-off scope of the land aerodrome allowed the machine to be more highly loaded and to have other qualities which gave it higher performance in the air. And even in 1943, when Naval pilots had found that the Spitfire could be worked from carrier decks and so had introduced the Seafire to the Fleet Air Arm and when the tendency was to put up the performance of ship-borne machines, it still remained true that the Seafire was the lowest performance aircraft of this type—in other words there were shore-based Spitfires working at the time with a higher air performance. But although the ship-based machine was inferior in performance to the land-based machine, its base was mobile. It could move its base—the carrier—close to the fighting line, or in other words to where the fleets were engaged, a thing to be given practical demonstration in the Salerno landing of September 1943. To some extent, therefore, the ship-based aircraft made up for its inferior performance by its lower landing-ground sensitiveness. It could be put down on a carrier deck which meant that it could move its base nearer to the battle. The ultra-high performance, ultra-modern fighter was forced to work from a place miles behind the lines where it could get the landing and taking-off runs needed. Similarly the heavy bomber had to work from places where it could get the landing and taking-off runs. But the slower, smaller weight-lifting ship-borne aircraft could work from a base near the battle because it was less landing-ground sensitive.

We may state the law that landing-ground sensitiveness increases with air performance and the corollary that landing-ground sensitiveness diminishes the military and civil value of air performance. The point is readily seen by an extreme exaggeration. Suppose an aircraft were to be built for transporting passengers at 1,000 miles an hour. But supposing that it were so landing-ground sensitive that it could only be worked from some open space specially levelled and prepared in the north of England

(there being, we pretend, no other site large enough and free enough from obstructions in the form of buildings, woods, hills and the like to allow the necessary space). Then what that ultra-high-speed aeroplane gains in the air, it may lose again on the ground through its landing-ground sensitiveness and the fact that it must transfer its passengers for London to some much slower type of transport vehicle miles away from their destination. The two things go on a sliding scale therefore. Put up the landing speed and up goes the aerodrome requirement and down the operating flexibility. A balance must always be struck. When civil or military transport aircraft are being specified, their aerodrome sensitiveness ought also to be specified for that really determines the end result. Undoubtedly the motor-car gained some of its remarkable popularity because it was not base-sensitive. The motor-car requires no elaborate station with platforms and buffers and other devices. It requires no long, concrete runways and control towers. It can operate from any little shed in the back garden. The motor-car may not be able to set up the average speeds of the great long-distance express; but it gets its passengers to their destination through being less base-sensitive. We should remember this in all dealings with aircraft and in trying to sort out the kind of aircraft that are likely to be useful in the future. When the attempt is made to meet the different requirements of military and civil air transport it becomes at once apparent that we are facing a problem which has a close resemblance to the tactical problems faced by the commanders during the first three years of the war. We are facing a problem of co-operation. There must be somewhere co-operation between the air vehicle and the land vehicle and between the air vehicle and the sea vehicle. Here is the deeper justification for the Ministry of Transport which covers the whole range of transport. For if the three fighting Services can work to their full effectiveness only when they all three come under a single Ministry, so the three forms of transport vehicle, for air, for land and for sea, can only be expected to work to their full effectiveness when they are the interest of a single Ministry. When a commander is considering the employment of air transport, or when a business house is considering it, then the co-operation between the land and air and sea vehicles must be kept in mind. There is an optimum point where harmony is found between air performance, landing-ground sensitiveness and land transport flexibility. The aim is always to find that point and so to adjust the abilities of the different transport vehicles that they achieve this harmony. And this adjustment must be set against another. This second one concerns weights carried. The first may

be said to be a spatial adjustment in which the transport line is divided between the best speed over distances to give the best average over the entire distance. Thus between London and New York it might be that the best over-all results would be obtained so far as speed is concerned by mixed transport, land and air. There might be two cities, 2,000 miles apart, in which the fastest travel would be secured—1,850 miles by air and 150 by motor-car. That would imply that the cities were of the highly congested and elaborated kinds where vast regions cannot be set aside as aerodrome space and that the aircraft used were of fairly high performance types and therefore types of high aerodrome sensitiveness. The motor car stage might well be lengthened much beyond this if still higher air speeds were being sought. But every change of vehicle lowers speed and efficiency. The introduction of a railway section in countries possessing highly developed railways would not often be justifiable for the high-speed traffic because of the changes of vehicle. Although we have here to recall the interesting experiment of Gatwick Airport which was built not long before the war of 1939 on the main railway line between London and the south coast of England. A subway connected the disembarking point for the aircraft with the platform of the railway so that passengers could travel to the London terminus by air and rail. More often, however, the great flexibility of motor car land transport fits in better for co-operation with air transport than the railways and that brings me to the next point that has to be considered. This may be put in the form of the question: Is there a special kind of cargo suited to air transport; a special kind suited to land transport and a special kind suited to sea transport? If, for instance, it is agreed that the motor vehicle is the complement to the aircraft for high-speed passenger travel, then where do the railways come in? The answer may be that the railways are still suited to the transport of weighty cargoes where there is no special urgency and this quite apart from their evident value for short-range shuttle services such as are common between big towns and the suburban dormitory areas. Ships and trains are well fitted to the transport of extremely bulky and heavy cargoes which are not urgent. Some 50 biggish transport aircraft are needed to carry the load of a single freight train and some 150 to carry the load of a single middle-size cargo ship. Here is a calculation which has its value in enabling the picture to be seen in perspective. It was made by the editorial staff of *The Engineer* and it related to the "Liberty" ships which were at the time in full production in America. The reasoning went as follows. A 70-ton aircraft is taken as

the basis, this being about the size of the Martin Mars already referred to, and it is assumed that the disposable load is 35 tons of which half is used for fuel on a journey assumed to entail the Atlantic crossing. The cargo-carrying capacity of the ship is 10,000 tons and the time it would take would be four or five times that of the aircraft. So one hundred of these large aircraft are equivalent as carriers to one ship. As to cost we turn to Mr. C. H. Dickens, vice-president of the Canadian Pacific Air Lines, who, in 1942, gave the cost per ton mile for a passenger service across the Atlantic at 28 cents or 225 dollars per passenger. It is fair to add, however, that, at about the same time, Mr. F. G. Miles, the British constructor, had given much more favourable figures.

Enough has been said to show that so many points are unsettled that direct comparisons between aircraft and other forms of transport are extremely difficult. But it is the fact that the modern bomber achieves between 20 and 30 ton miles per gallon of fuel. We have here, therefore, an inkling of the deeper truth that all forms of transport are in some ways comparable and that the time factor must be a decisive one; for the higher the speed demanded, so the larger the machine weight and paraphernalia complexity required to achieve it. This is not a problem in absolute cost. If it were every form of cargo would go by canal. The time factor is bound up with the cost factor and cannot be separated from it. We now venture to forecast the air carriers and their auxiliaries of the future.

On the long-range routes the high flying, large size flying boat. No limit is in sight to the size of such aircraft. One guess is as good as another. If a figure of one thousand tons were given it would be within the justifiable scope of the first critic to double that figure and to speak of 2,000-ton flying boats. No doubt size will increase rapidly for some time in the future and will then be subjected to a gradual slowing process as occurred with ships. Where the limit will be found is not yet predictable. So much depends upon the kind of marine airports that spring up and upon the accommodation they offer. These largest air carriers will be used on the longest routes. They will be fast machines and they will be base-sensitive. But it is doubtful if the flying boat will be as fast as the landplane and the next step down in size will be the large landplane. This will be, if these predictions are correct, the ultra-high-speed aircraft and will also be a stratosphere machine. The power units of most high-flying machines are likely to be of the reaction variety because such units should be more efficient at height than the conventional internal combustion crank engine. (The term crank has to be

added because certain kinds of jet engines are internal combustion units). The ultra-high-speed landplane will be the "Blue Train" of the air. It will be the climax of transport development, commanding the highest fees and having the greatest say in development and organisation. Top speeds of 500 miles an hour will not be beyond the reach of such machines in the comparatively near future if past rates of performance progress are anything to go by. It is true that the World War II fighter struggled long and arduously enough to get to and to pass the 400 miles an hour mark which seems to indicate that the much bigger and more unwieldy commercial machine will also have difficulties in pushing its maximum speed up much above the 300/330 miles an hour region where it seems now to have become stuck. But if there is a revolution in prime movers, as many engineers expect, there should go with it a sharp jump in speed. We may say, therefore, without taking very grave risks of being proved wrong, that the aerial blue trains of the future will fly about 35,000 feet, will have a maximum speed of 500 miles an hour and will cruise at about 380 miles an hour as a regular thing. Such aircraft cannot be predicted seriously unless it is also contemplated that large steps forward are taken in the landing-grounds made to accommodate them or in the methods of landing and taking-off. It is likely that the carrier technique will be adapted for land use where it can help in reducing the length of run needed. Arrestor gear, for example, would not only reduce the demands on aerodrome space but would also provide a safety measure against the failure of hydraulics and electrical gear and landings made with a load but without wing flaps. Accelerators, too, should be generally available for aiding the take-off. The aerial blue train will be an aeroplane with an extremely high wing loading and it will need an accelerator to get it into the air with a reasonable run and with reasonable security. For the landing it will almost certainly want an arrestor gear. Carrier operation will make its mark upon land-base operation unless some unexpected invention enables speed ranges to be extended far beyond anything yet possible with fixed wing aircraft.

Speed range is the thing that counts in estimating an aeroplane's performance in relation to its landing-ground sensitiveness. The aircraft with the greatest speed range is the true helicopter of the type developed by Sikorsky in the United States. This aircraft has a slightly greater speed range than the Autogiro (which has a free lifting windmill and not a power-driven lifting screw) because it can hover in still air. But both Autogiro and Sikorsky helicopter—and the pre-war Focke-Wulf helicopter—have

a wider speed range than any fixed wing aeroplane owing to their slow flying abilities. But their fast-flying abilities are not nearly so highly developed, nor are their rate of climb, load or range abilities. In fact if the speed range of the moving wing aircraft is desired, it can be had only by sacrificing the high performance characteristics of the fixed wing machine. The frequent popular cry for an aircraft that can hover with its associated praise for the Autogiros and helicopters (machines "you can land in your back garden") is built up on a misconception. Aeronautical engineers, as much as the wider public, want to provide aircraft with the ability to hover and to land and to take off without a run. But they do not want to sacrifice the top speed, climb and weight-lifting capabilities of their machines in doing it. It is no good building an air liner which can land and take off in its own length if its top speed is no higher than that of a motor-car and it can carry only one person—the pilot. So the moving wing designers have been working on something which is generally desired; but their problem has been to combine that something—low speed and short run landing and take-off and the power to hover—with the qualities which have made aeroplanes useful: high top speed, good climb and long range. If they could do that, the helicopter or other moving wing machine would oust the fixed wing machine from favour. But so far when a specification is being prepared for a military or a civil machine, the first requirements are always or nearly always for load and range and speed and climb. Once there was an exception; when the Royal Air Force supplied the Army with Army Co-operation aircraft of the Autogiro type. These machines were in use on Army Co-operation duties for some time and were thought likely to become standard for this work; but their shortcomings were too much and they were abandoned as a standard Army Co-operation type about the outbreak of war. The point does show, however, that the popular belief that there is some official prejudice against aircraft with slow flying and short run take-off and landing capabilities, is unfounded. These qualities have always been wanted; they are still wanted and they probably always will be wanted—but only when they can be combined with the other qualities which give aircraft their only claims to serious attention for war or peace; that is high top speed, good range and good climb. The helicopter may come into favour for special duties. The need for low-speed flying qualifications is still great for some kinds of Army Co-operation work and for some kinds of Naval Co-operation work—especially submarine patrol by ship-borne aircraft. But the moving wing machine has not otherwise

made out its case. Consequently our air express of the future, taking the high-speed passenger traffic, will be more likely to be a fixed-wing machine working in conjunction with accelerator and with arrester gear for take-off and landing and working from well-prepared fully equipped aerodromes in open country. The aerial blue train will set, we must suppose, a high standard of luxury and will therefore depend upon the existence in the leading countries of the world of sections of wealthy people or of businesses which are ready to give their representatives the most luxurious form of travel. But in contemplating this type of aircraft of the future one comes against the philosophical doubts once more. Why should people want to travel far and fast? What purpose is served by moving, as we have put it, from one streamlined set of surroundings to another almost indistinguishable from it? Perhaps the answer will be that the streamlined surroundings will not resemble one another quite so closely. France, for instance, was always the world's playground and every person who arrived at a state of wealth and leisure went to France for his holidays and relaxation. France knew how to live and no other country was capable of competing with it in the fundamentals of the life of pleasure. Indeed no other country knew anything about the pleasures of life when compared with France. The very air of Paris seemed to enliven the dullest, business-drunk, man and to enlighten the flattest woman. And the south of France had its watering-places which were the aim and object of all hedonists and pleasure-seekers from the Pacific coast to Persia. If France revives her old glories and sets the pace once more for good living and lively existence, then it will follow that there will be candidates for the aerial blue trains in plenty. We have then two types; the very large, somewhat businesslike flying boat and the ultra-fast, ultra-luxurious, high altitude air express. Next in the scale going down in size and complexity is the feeder-line aircraft and ferry machine. In Great Britain there were among the very few air lines that were able to pay their way without subsidy, a few air ferries over the mouths of rivers, or narrow necks of sea. In these instances the special advantage offered by air travel was the advantage of freedom from vehicle changes. A person travelling from London to the Isle of Wight or even from Portsmouth to the Isle of Wight, found it more convenient to go direct by air than to go to the coast by train and then to change vehicle to do the crossing over the narrow strip of water, and then to change vehicle again for the final stretch to his town of destination. The same applied to the Bristol Channel ferries and to the line that operated between England and the Scilly Isles.

As the run gets shorter in distance, then, so the high speed of the aircraft plays a less important part relatively while its ability to ply over both land and sea and to enable its passengers to dispense with vehicle changes, plays a more important part. The feeder-line aircraft, then, must be conceived in a different frame altogether from the long-range express. It must have some of those slow landing qualities already discussed and it must be of a size suited to giving high frequency of service. It would be better, for example, that the feeder line should offer one service an hour with a smaller machine than one service a day with a much larger machine. The de Havilland Flamingo, which made its appearance on some of the internal air lines not long before the outbreak of World War II, was a machine of special merit as forecasting accurately the kind of aircraft that would be best suited to the feeder and ferry lines though it had certain failings related to other matters. In this class of machine there is some resemblance to the motor omnibus and it seeks to perform duties which are somewhat like those performed by the omnibus. But it is unlikely that air lines would be popular if they went to the extent London Transport, for instance, has gone in sacrificing comfort to pay load. The air passenger will almost certainly demand a fairly high degree of comfort even in the short-range ferry and feeder machines. But otherwise the bus idea holds good.

Last among the civil types to be considered is the private owner aircraft and here a field of dispute and uncertainty is approached. Some of the reasons will already have been noted. They may be resumed as follows: If great air lines running to all parts are indeed to make their junction in the British Isles then the English air must be given over largely to these air lines. It would be impossible to take the risk of having an aerial blue train, cruising at some fantastically high speed, perhaps through poor visibility and on radio direction, running through a region where innumerable private owners might be floating about in their own little machines. Such circumstances would introduce high risks of collision and of heavy accident figures. The big air lines must be routed and from their routes privately owned aircraft, not equipped with appropriate apparatus, must be excluded. It is impossible to visualise any other arrangement. But it follows that the value of the private aircraft diminishes as its field of operations is reduced by traffic regulations. The private motor-car has its attraction partly because it is not excluded from any public road and can use these roads as freely as the lorries and buses. It might be possible to make private aircraft and to equip them with the apparatus which would enable them, when rightly

commanded, to work on the main air express routes. If a private owner, for instance, possessed a fully equipped medium size aircraft working it somewhat in the capacity of a yacht, and if he had in his employ a fully qualified pilot, there would seem no reason why the aircraft should not be given as much air freedom as the big air liner. But the term "fully equipped" is one of the problems and the term "fully qualified" is the other. Private flying would not be itself if simple types of aircraft were excluded and if only pilots holding all the licences and certificates were allowed to fly them. It would then become an offshoot of commercial flying. The air yacht, fully equipped with all radio aids, commanded by a captain holding all the licences and certificates would be able, then, to fly where it wished, the only limitations being that it conformed to the rules of air traffic and obeyed all the regulations laid down to ensure its safety and efficiency. But there is still that delightful picture that remains in the minds of everybody who thinks on this subject, of the small privately owned machine, seating perhaps three or four people and piloted and commanded by the owner himself; the "family" aeroplane to be used for touring and for getting about the country. That aeroplane is difficult to fit into the civil aviation picture satisfactorily. If it is given full freedom then it will inevitably become a danger to the big air liners. It would not have all the radio aids which would ensure that it would fly on the right course to avoid collisions and that it would behave in conformity with other aircraft during the increasingly elaborate manœuvring and "orbiting" and "stacking" that must occur at the airports before landings are made. Its simplicity, in brief, which gives it its attraction to the buyer, is a disadvantage to it in the air. But let it be supposed that the ingenuity of aeronautical engineers is such that the private aeroplane can in the end be provided with all the necessary aids and equipment without the price going up too high for the purses of private people, then there comes the problem of the pilot.

Without doubt the medical standards of air-line pilots will be high. They will be medically examined once every six months and their flying will be rigidly controlled so that they do not become "air tired." Medicine will play a large part in controlling the activities of commercial air-line pilots. In addition they will be men with an extensive special education. They will hold many licences and certificates and they will be the possessors of long experience gathered as second pilots. They will enjoy special facilities to ensure that they are kept informed of the latest rules and regulations governing all kinds of air transport. Now it may be that some private owners,

men who make flying their hobby and can devote themselves to it heart and soul, will be able to keep pace with all these rules and regulations, to do the work that will allow them to pass all the proficiency examinations and to keep themselves informed of changes. Some of them, no doubt, will be able to pass the medical tests and will be ready to conform to the requirements about fatigue and the rest. But the number will be very small. The number of private owners, therefore, who will be able to pilot their own aircraft and to use them freely over all parts and along all the main air routes, will be extremely small. Does that mean that the cheap and simple aircraft will have no place in the future scheme of things and that the amateur flyer—to whom so much was owed at the outbreak of the war of 1939—will cease to exist? Largely the answer must depend upon Government action. It will depend upon whether practical means can be devised to give such amateur or "sport" flyers sufficient freedom to allow sport flying to be attractive, without at the same time endangering the big commercial air lines. On first glance the problem appears insoluble. But if radio aids continue to develop it is at least possible that the routing of the big air liners will become more and more exact, and less and less dependent on the weather. If the air liners were to be able to fly on fixed routes and if their punctuality were to be brought up to a high pitch, it becomes possible for them to work safely yet not to call for very large air spaces to be kept free for them. If then, the air space demanded by the air liners, were to be reduced, it would become possible to restrict the amateur flyer's activities by a few simple rules. He could then be given a sufficient freedom to make amateur flying worth while. If that came about we should certainly see the cheap and attractive light aeroplane making its appearance. The first and greatest step towards it was the de Havilland Moth; but since the Moth a number of other aircraft have appeared in about the same weight category and showing signs of even greater suitability for private ownership. Some of them are American and have been used extensively by the Royal Air Force as light communications machines. Some are British. The scope for the designer in the production of a popular light weight, cheap aircraft is very great and the exercise would attract many men of eminence in aeronautical engineering. Moreover such a machine, if the arrangements for its use could be made simple and sane, would give much pleasure to many. The advantages of the private motor-car would be provided with some additional advantages not obtainable from any but air vehicles.

Military aircraft of the future are less readily forecast than civil; but a few

probabilities can be derived from the framework, political and administrative, on which they may be hung. And as the civil machines will serve to give people the power to expand and to reach out to wider fields for business and pleasure, so will the military machines cover a greater area and enable fighting forces to reach out much greater distances and so to work to a grander grand strategy. The single fighting force coming within the single political framework of a Ministry of War and having within it the three equal departments of sea, air and land would set the pace for aircraft development and would suggest that the biggest differences and changes would occur in aircraft such as troop transport machines, torpedo bombers and anti-submarine aircraft rather than in fighters and long-range strategical bombers. We may look first at what the Army would need, for it has been proposed that the man standing on his two feet on the ground should be looked on as the arbiter. The Army would need two chief kinds of aircraft; those for blasting open a way for its tanks, guns and infantry and those for carrying its tanks, guns and infantry together with all their supplies and equipment. Armies must become in steadily increasing measure, airborne. They will graduate gradually from the motor vehicles which they now mainly use to aircraft. The Army of the future should be looked on as mainly an airborne army. The speed which the extensive use of aircraft would give it would enable it to reach out beyond the range of the landlocked army to strike at the enemy at distant points before he could prepare defences there. Fire power and movement are the two classic components of an army. But the relationship between them is not always very clearly set out by the military writers and experts. Yet they are inextricably related. The fire power, which may be looked on as the effectiveness with which the guns available are used rather than as a count of guns, is influenced by the speed at which they can be carried to the critical area. Effectiveness of fire power for a given weight of equipment goes up as the speed at which it is brought to the field of action goes up. Thus a strong point that can be taken by one man and a machine-gun if the attack is made suddenly and swiftly, may hold up a division if the attack is made slowly and only after a ponderous gathering of momentum. For during the gathering of momentum, the enemy is able to improve his defences. If the assault is swift the defences will not have been specially stiffened to meet any specific attack and it then follows that the smaller weight of equipment (or fewer and smaller guns) will have a greater effective fire power. Their bullets and shells will meet less resistance owing to the swiftness with which

they have been conveyed to the field of action. It therefore emerges that the army will need and will have to develop aircraft to carry every kind of army equipment. Large guns, tanks, supplies of all kinds, fuel and food will all have to be given appropriate carrying aircraft. The parachute troops are really a forerunner of the fully airborne armies of the future. For the big guns and the tanks extremely large aircraft would be needed; but they would not resemble the large commercial transport aircraft, the reason being that their object would be to convey these great weights without at the same time becoming ultra-sensitive to landing space. The tank-carrying aircraft and the big gun-carrying aircraft would have to have a low landing speed. The first conception of such machines was the towed glider, and it has yet to be shown that this type is wrong although many experienced and thoughtful specialists are against it. Loading and unloading becomes a major problem in the design of the Army weight carrier; for there must be a low loading line or else additional and cumbersome equipment is required to enable the heavy vehicles and tanks and mobile guns to move into the aircraft under their own power. And this emergence of the need for slow landing qualities in the aircraft which are to carry heavy army equipment points to another fact concerning all Army aircraft. They must be scaled as to their landing speeds in accordance with their duties. Where landing facilities for high-speed aircraft are available, the higher the speeds of the machines used the better. On the other hand there is a need for aircraft which can fly extremely slowly in order that men and equipment could be landed at points where no large landing areas are available. The original conception of the parachutist—and a conception which still applies with full force—is that he is conveyed to the place he is to attack at extremely high speed, yet is able to get down there without being “landing-ground sensitive.” The parachutist wants a very small space to which to land safely; he is not like a high-speed aircraft. He therefore combines in himself the tactical advantages of ultra-high-speed transport and low landing speed. But he will certainly be supported in these qualities by aircraft in the future and here we see further possibilities for the limited use in addition to gliders, of moving wing machines such as the Autogiro and the helicopter. The Army would need the ultra-clean aerodynamically and ultra-high-speed aircraft just as much as the civil air lines would want it, for the carriage of special service troops and the like. But the Army would want also the low landing-speed aircraft in which low aerodrome-sensitivity was regarded as important and much else sacrificed to

it. It seems almost certain that the tank-carrying and big gun-carrying aircraft would be used only where they could be given a reasonably high measure of fighter cover so that they would not be expected to compete with strong air attacks. They would be mere carriers, even less aggressive than merchant ships, and their protection would be confided to the air force machines detailed to escort them. The consequence is that slow aircraft would here be permissible because they would have advantages in low aerodrome-sensitiveness.

The Army, then, would use ultra-high-speed troop carriers, machines in the 400 miles an hour class, and comparatively low speed, short landing weight-carriers for big equipment. In between there would be the hosts of intermediate vehicles just as there have been in Army land transport vehicles. On the assault side we may be certain that there would be extensive developments if there were a single-Service system such as has been suggested, for then Army thought would be given greater scope to consider and to propose. The dive-bomber might turn into something useful if it were taken up by progressive designers not too much mesmerised by the somewhat antique Junkers 87. But whatever the fate of that type, it is certain that the low-level assault machine would be highly developed for it is a type which has proved its worth in all big land battles. In the Stormovik or IL2, the Soviet forces have developed a useful assault aircraft and the rocket bomb that can be launched from the Stormovik and from the LAGG-3 is a weapon which may well be the precursor of many other similar weapons. The same is certainly true of the glide bomb mentioned as being in use by the Germans in the Prime Minister's speech of the 21st September 1943. This is really the genuine "aerial torpedo." But undoubtedly one value of the low-level assault aircraft will be in the delivery of cannon attacks, using the term cannon here to mean any aircraft gun firing explosive shells. This would include all the shell-firing guns from 15 mm. upwards but not the .5 inch machine-guns so successfully used by the United States Army Air Forces. Development in the war of 1939 has moved forward from the eight machine-guns, which armed the Spitfires and Hurricanes of the air battle of Britain period, to the four 20 mm. cannon of the later mark Hurricane, the four 20 mm. cannon and six .303 machine-guns of the Beaufighter, the 40 mm. cannon of the Hurricane IID. The Germans in the period of war extending from the outbreak until the battle for Tunisia began, stepped up their armament from the two cannon and two machine-guns of the early fighters to the four 20 mm. cannon and two machine-guns (the cannon

consisting of two wing root mounted 20 mm. Mausers and two wing mounted 20 mm. Oerlikons) of the Focke-Wulf 190 and the extremely interesting 15 mm. barrette mounted rearward firing guns, remote controlled from a fire top in the forward cabin enclosure, of the Messerschmitt 210. Later 37 mm. Mausers were reported in use. United States armament went through a like development and began with sometimes four machine-guns and went on to the eight .5 inch machine-guns of the Republic Thunderbolt single-seat fighter and the twelve .5 inch machine-guns and one .303 inch machine-gun of the Boeing Fortress, an armament later stepped up to no fewer than 16 guns. Russian armament included a number of gun sizes not seen in British, American, or German aircraft. They use cannon of 30 mm. size and more in both fighters and low-level assault aircraft. The United States in their earlier Airacobra had sought to introduce a 37 mm. cannon but the Royal Air Force, to which Service this aircraft was first delivered for operational duties, took out this cannon and replaced it with a 20 mm. weapon. The general trend of all this work is unmistakable. It is towards the larger cannon and therefore follows exactly the trend as seen in land and in sea warfare. There is nearly always this striving for greater hitting power by increased size of weapon. The problems of fitting large guns in aircraft are many. In the first place the single-engined machine must either mount its cannon in the wing (as in the Hurricane) or else it must mount them in the fuselage or the wing roots (as the two Mausers in the Focke-Wulf 190) and then interrupt or synchronise their fire in order to prevent the bullets or shells from hitting the airscrew blades. This interruption or synchronisation (they are not quite the same thing) always retards the gun's rate of fire compared with its rate when firing free. On the other hand the mounting of guns in the wings causes the platform to be less rigid and the line of aim to be slightly off centre, both small defects which cannot be entirely ignored. They become larger defects when larger cannon sizes are considered.

The mounting of 40 mm. cannon in aircraft such as the Hurricane IID carries, had been under discussion or trial for a great many years; but until lately the difficulties have been so great as to make it difficult or impossible to fit a battery of 40 mm. cannon in an aircraft in such a way as to derive sufficient benefits to compensate for the additional weight and for the lower rate of fire compared with machine-guns. Nevertheless we must suppose that the increase in aircraft cannon size has by no means reached a resting-point. It is only at the start of its development

and it takes no particular foresight to predict with confidence large increases in aircraft cannon size in the near future. The 40 mm. cannon is after all not a very large step over the 37 mm. which was fitted to the original Airacobra; but it will certainly be followed by 75 mm. guns and even larger guns. We shall have artillery aeroplanes carrying really big guns with few rounds and intended for making low-level attacks on objectives which will not yield to bombing either owing to the difficulties of hitting them with bombs or owing to the low striking velocity of bombs compared with what is possible with an appropriate cannon. The army of the future will not only send its infantry into the air, but it will to some extent send its artillery into the air. The aerial artillery machine has obvious advantages owing to the accuracy of its mode of attack. It could hit specified buildings and blockhouses which might not be vulnerable to any other form of assault. The only practical alternative to the artillery machine would be the rocket machine, in which the armament would consist entirely in projectors for self-propelled missiles.

The Royal Navy, like the Army, would, under a unified fighting Service, be free to transfer as much of its attention as it thought fit to specialised aircraft for its specialised duties. Chief among these is the torpedo carrier. A sad story is written around the development of British torpedo-carrying aircraft. It is, however, a legacy of the three independent Service system, a system which had to be modified in fact though not in name during the course of the war and at the dictates of military events. Behind the poverty of ideas and slowness of progress with this type of aircraft there is the clash of strong personalities, each of them holding strong views and not prepared to be shaken. The sonorous name of Lord Trenchard rolls around the whole matter of torpedo aircraft development and clashes and chimes with the name of Lord Chatfield. Lord Trenchard, so single-minded in his advocacy of air that he could not conceive that ships or trains and motor vehicles had any value at all, scornfully rejected the plea of those who wanted to develop naval aviation. Lord Chatfield attributed to this over-valuation of aviation the backwardness of the naval air equipment. The torpedo carrier is perhaps the most difficult of all war aircraft to discuss. For in it are brought together, just as in the personalities in the House of Lords who have just been mentioned, sharply conflicting aims. First the torpedo carrier should be fast in order to be able to get to its objective with a minimum risk of interception. Second it should be highly manoeuvrable in order to stand a reasonable chance of getting away safely after launching

its torpedo. And third it should have the ability to fly slowly when required. A study of the technique of torpedo dropping, as it was at the earlier part of the war, will illustrate why these conflicting needs have to be met. The pilot had to approach his target and then at whatever range he has decided to attack, he had to level out very close to the surface of the water, and to fly straight during the actual launching of the torpedo. At this time, too, he had to fly very slowly. The consequence was that at the moment of making the attack the torpedo-carrying aircraft became exceedingly vulnerable to fire from the ships being attacked. And directly the torpedo had gone the pilot might desire to go into a steep turn in the process of taking evasive action and making the fastest possible get-away. The old and much abused Fairey Swordfish had the capacity to fly very slowly, but unfortunately it could not fly fast. It had the capacity to manoeuvre sharply but not to make a rapid get-away. For the actual launching of the torpedo the Fairey Swordfish was a good aeroplane. For going out to the target and getting back again it was a very bad aeroplane. But another thing comes into the matter, the aircraft's deck-flying qualities. Again the Swordfish was excellent. Fleet Air Arm pilots who made torpedo attacks on the Bismarck took off and landed on in weather which would have prevented the deck operation of faster and more modern types of machine. Torpedo-carrying aircraft can be shore-based and aircraft like the Wellington, the Hampden and, later, the Marauder and the Beaufighter were adapted to carrying torpedoes. But the shore-based aircraft could not at first make the fullest use of its additional speed over the ship-based craft because of the need, already mentioned, to fly slowly at the moment of dropping the torpedo. Later an invention appeared which made it possible to launch a torpedo from an aircraft flying fast and a good deal higher than was formerly the practice. This freed the torpedo-carrying aeroplane from some of the restrictions to performance that were applying in the earlier stages. Pneumatic air brakes were also used in such machines as Beaufighters. There followed a period of swifter development. But the Fairey Barracuda had been ordered somewhat early in the proceedings to take advantage of the later technique. It would be hazardous to try here to give even the vaguest indications of the probable trend of development in torpedo-carrying aeroplanes. It can be predicted, however, that the air performance of these machines will be improved, that the torpedo will be (unlike the Barracuda, Swordfish and Albacore arrangement) internally stowed because in that arrangement it creates no unnecessary drag and is well

placed to be kept at a temperature favourable to its accurate working after being launched. The trend at the time these words are being written is towards much higher air performance for all naval aircraft. Rear-Admiral Boyd, who just prior to his appointment to take charge of Naval air service equipment, had had personal experience of every kind of air attack on ships, came to his task with a fixed determination to improve the air performance of naval machines and to sweep aside the older conception that naval aircraft, by virtue of their having to work from flight decks, must always be much inferior to land-based aircraft in their air performance. He admitted that there must be a difference, but refused steadfastly to accept the big difference that had previously been looked on as inevitable. Thoughtful, close-contained but solidly obstinate where he believed himself to be right as a result of personal experience, Admiral Boyd set out to give the Royal Navy aircraft worthy of it. And among his first steps were those designed to break down the traditional acceptance of a much lower performance status than shore-based machines. He set out with the sailing view that anything with wings could be worked from a flight deck if the men were bold enough and the equipment well thought out enough. His extremely progressive views were an asset to the Royal Naval air service, and from the time of his appointment (with Rear-Admiral Portal to be Assistant Chief of the Naval Staff (Air)), as has been mentioned an improvement in naval aircraft could be distinguished. Fighters were introduced, following the line of the Seafire, which closely approached the air performance of land-based fighters. Dive-bombers for naval use were given a fresh chance to prove their worth at sea in British hands (they had earlier proved their worth in United States, German and Japanese hands). A new spirit transformed the Fleet Air Arm with the appointment of these two bold and determined officers and the Royal Navy worked to make good the handicaps under which it had started to build up its air side. Numerous naval aircraft in addition to those mentioned came into the picture, but they cannot be discussed here. We turn now to the two chief types of air-war aircraft; the two types on which the theory of the separate air service is largely based, the bombers and the fighters.

On each type of military aircraft a book could be written and it must be emphasised that all that is being done here is to attempt to peer a little way into the future and to see what will be the general trends as they affect the growing power of the air and its employment in extending the scope of strategy, communications and transport. The medium bomber will first be

discussed and from this discussion the dive-bomber itself will be excluded, though this method of bombing must be taken note of for reasons which will appear later. The first question that must be answered is why it should be necessary to have medium bombers. Would it not be better to devote the whole of the productive effort to heavy bombers? The answer is that the heavy bomber cannot do some kinds of bombing, among them being the kind that is done from medium and low levels in the face of hostile anti-aircraft fire. The heavy bombers, as the Eighth United States Army Air Force proved by its successful operations against Germany in the daylight from bases in Britain, can work in full light; but the conditions must be right and they must usually go over to their targets and bomb those targets from a great height. If they were to try to work low, they would probably suffer heavy casualties not so much from fighters as from anti-aircraft fire. Increasing the size of a bomber increases the target area for the gunners and therefore increases vulnerability when other things are equal. If the big bomber were faster than the smaller bomber, the increased target area might be cancelled out by the increased speed; but in fact the big bomber is always slower than the smaller bomber assuming equal design merit. The consequence is that the smaller bomber has a large advantage in reduced vulnerability to anti-aircraft fire and can work low down where the big bomber might be too vulnerable. It is, from the production point of view, a pity that the medium bomber should have to be built. But the first three and a half years of war did not suggest that it could be dispensed with. In fact it had done useful service in Libya and many other regions. The Soviet air force was believed to have used this type extensively in their second great offensive against the invading German forces. There are two kinds of bomber to be considered, the highly specialised and the adaptable and as ever the highly specialised is the more interesting. The most remarkable example is the de Havilland Mosquito which first came into the news in 1942 on the 26th of September, with a low-level attack on the Gestapo headquarters at Oslo. The idea behind the Mosquito was an old and exceedingly attractive one; that a medium bomber could be built of such high-speed characteristics as to be able to penetrate strong enemy defences, drop its bombs and get home again without on the way having to engage enemy aircraft in battle. The theory is certainly a sound one provided that the speed capabilities of the aircraft used are correctly related to those of the fastest defending fighters it might have to meet. It should be not less than ten miles an hour faster than these defending fighters. Unfortunately the Mosquito was

delayed several times in the course of production and came out a little too late to justify the theory up to the hilt. But it did do much in that direction and the theory could have been completely justified had the Air Staff accepted a plan put before it in 1939 to use the Mayo composite launch for this purpose. Use of the composite launch would have enabled an extremely highly loaded, single-engined aircraft to have taken off with the assistance of the lower component, and to have reached operating height. The upper, or operating component, could have been made so as to have a speed at least ten miles an hour in excess of the fastest fighter working at the time. These facts can be tested through study of the plan put before the Air Staff. This gave the upper component a top speed of at least 400 miles an hour (the calculated figure was higher) with a range of 2,000 miles and a 2,000 lb. bomb load in the year 1939. There was nothing fantastically experimental about this plan for the Mayo composite system of launching an upper component held and still holds at the time of writing the international seaplane record for distance in a straight line. This record was taken from the Germans in October 1928 by Captain (now Air Commodore) D. C. T. Bennett, C.B.E., D.S.O., and First Officer L. Harvey who flew from Dundee to Port Nolloth in South Africa non-stop in the Short Mayo Mercury with four Napier Rapier engines, the distance being a fraction under 6,000 miles. This astonishing feat was done by a float seaplane, notoriously the least efficient kind of aircraft. It amply justified the Mayo invention which stands as the strangest thing of its kind. The idea of locking two aircraft together, causing them to aid one another at the take-off, and then to separate so that the upper component may go off on its appointed task and the lower component may land again and get ready to do its part in the launching of another upper component is still a little strange. The invention has the disadvantage that it looks weird. It looks as mad as the maddest invention ever planned, yet it works. I have twice seen the take-off and separation of the Mayo composite aircraft, and a large number of take-offs and separations has been done. There has never been any serious trouble and nobody can dispute that the upper component can be given, by this means, a performance superior to anything possible by direct take-off methods. It is one of the tragedies of the war that this remarkable British invention was not fully understood or appreciated by the Air Staff with the consequence that they missed a good opportunity for aiding the bombing offensive. Instead of this the Air Staff were then firm in the belief that the big four-engined bomber could do everything that the upper

component of the Mayo composite aircraft might be able to do. It was not until Bomber Command had repeatedly tried to use its big bombers over Germany and repeatedly found that its casualties were so high as to enforce occasional pauses in the offensive, that the error became clear; but by then the opportunity had been lost and it was too late to attempt to retrace our steps and to introduce the composite bomber. The Mosquito, however, employed the tactical method that would have been employed by the composite bomber; it used speed to penetrate the defences and to get away again. But the composite bomber proposed in 1939 could have been in service in 1940, for it was designed by Mr. H. P. Folland (the most experienced of all fighter designers in Britain) who was responsible for a long line of superlatively good fighters from the S.E.5 of 1914-18 to the Gloster Gladiator of 1939) in such a way that it could be built simply and rapidly. In essence the idea behind it aided simplification for the composite bomber would have needed no power-operated gun-turrets. It would have been as simple an aircraft to build as the Mosquito and would have had but one engine instead of two.

The tactical method of employing such a high-speed, unarmed bomber was put before the Air Staff in 1939 with the plan for the machine. It was to entail a high-level approach to the target and a level, glide or dive-bombing of the target itself, with a "down-hill" high-speed get-away. A $5\frac{1}{2}$ degrees power glide will put up the speed of a fast bomber by 100 miles an hour, and the composite aircraft, had it been taken up at once and had it been put into service at the first opportunity, would have given the Royal Air Force a specialised medium bomber capable of reaching, for example, Berlin in the daylight and of bombing targets there without much risk of heavy loss. It is a great pity that the merits of this invention were not seen. The Air Staff were honestly anxious to understand the idea and spent a good deal of time upon it. No officer can be blamed for failing to give the idea his attention. But unfortunately the Mayo composite aircraft is an invention whose fundamental conception is so hard to understand that none of them was fully informed about it and the technical advisers who were brought in to give their opinions were ill-informed and were even making errors on the facts of evidence at the final stages of consideration. Such failures in appreciation are inevitable in time of war. There is always a strong resistance to the trying out of a strange invention of this kind. The risks of failure seem much greater the weirder the invention. By the fact of its "mad" appearance one of the inventions which might have given Britain

as big a technical advantage as the tanks gave her in 1914-18 was rejected. It is no good crying over spilt milk, yet the turning down of the Mayo composite bomber was a first-class tragedy and it is necessary to record the fact. The coming of the Mosquito, an aircraft with a top speed considerably lower than the upper component of the Mayo-Folland composite bomber could have had, proved the magnitude of the error. The Mosquito was a fraction too late. Its top speed was not sufficiently in excess of the top speed of the fighters, including the Focke-Wulf 190 that the Germans were able to bring against it. But the Mosquito came out in the latter part of 1942; the Mayo-Folland composite bomber would not only have been faster than the Mosquito, but would have come out in 1940 or at the latest early in 1941. It would have employed the tactical methods adopted for the Mosquito, but it would have had the margin of speed needed to make them effective. Let us note how this instance of inadequate appreciation affected the future of the medium bomber. This machine will stay the course so long as it can be made with a much higher speed than the heavy bomber. But the idea of the unarmed machine will not work unless some special invention is used to give it a big margin over the fighters it must expect to meet. Here is one of the great might-have-beens of the war. The use in 1940 and throughout 1941 of a high-speed, medium bomber, composite launched might have had useful consequences to the Allies because such an aircraft is versatile. It would not only have enabled the Allies to strike at places in Germany earlier than they did and with lower losses; but it would have conferred an increased mobility upon the Royal Air Force bomber units. The composite launched medium bomber might have been constituted in squadrons each of twelve aircraft with three lower components; the lower components not only to act as launchers, but also as transport machines for the personnel and equipment of the squadron. Lower components of the Whitley type were proposed in the 1939 project, but other larger machines could have been used. The lower component looked at not only as a launching but also as a transporting vehicle is of as great value as the upper component which does the actual striking. It is probable that the Royal Air Force would have been able to reinforce its bomber units by air in critical theatres where it was unable to do so without such units. Such, however, has been the advance in the devices for enabling heavily loaded aircraft to take off and such the work on long runways that the need for the composite bomber diminished as the war proceeded and by 1943 with Allied production attaining (with the Soviet) nearly 11,000 aircraft a month the call for the specialised medium

bomber of high-speed capabilities became less insistent. It was possible for the Royal Air Force to face extremely heavy losses yet to replace the men and machines without trouble. The flow of Allied men and machines was rising to full tide and in consequence the urgency with which each technical advantage was sought was less than in the earlier stages. When a country is short of fighting weapons it seeks desperately for inventions and novelties with which to redress the balance; but when it has numbers on its side it is usually confident that it can make do with such improvements as come in the ordinary line of progress. The medium bomber of the future will continue to exist only if it justifies itself through extremely high speed; speed much higher than can be obtained in the heavy bomber. With these limitations operating nothing more can usefully be said about the medium bomber and we turn to that remarkably interesting aeroplane the heavy bomber.

In 1939 the heavy bombing aeroplanes which Britain had made ready were twin-engined machines of notable excellence. They included the Vickers-Armstrongs Wellington, an aircraft with the most remarkable technological background of any machine that has made a complete success of its work in war. It was of geodetic construction, meaning that its structure was built up of geodetic members, winding basketwise, in the aerodynamic shape of the machine as opposed to the conventional construction in which a primary structure is the skeleton on which the external aerodynamic form is built up by means of struts, ribs, tie-rods, and the like. The Wellington had good load and range characteristics for its day and it also had power-operated gun turrets. In the original design these were of as original a conception as the structure of the machine and like the geodetic structure were the work of that distinguished technologist and designer Mr. B. N. Wallis, but later the Wallis idea for turrets mounted on axes parallel to the fore and aft line of the aeroplane was abandoned and the ordinary power-operated turrets, working on a vertical axis, were incorporated. With the Wellington bomber there was the Handley Page Hampden, a smaller machine but also exhibiting a number of interesting characteristics, notably the tadpole fuselage with the under-gunner's balcony position. The Armstrong Whitworth Whitley, which was later to come into full operational service, was then looked upon as obsolescent if not obsolete. Now these aeroplanes were the heavy bombers. But in 1936 the Air Staff had settled a policy for the building of very much bigger bombers; four-engined aeroplanes of great weight-lifting capacity. It was a far-sighted

decision and in 1942 it began to find its justification in the heavier bombing attacks that were made possible. Air Marshal Peirse began to receive a few of the bigger bombers, first of them being the Short Stirling; but it was Air Marshal Harris, later Air Chief Marshal Sir Arthur Harris, who had the task of deploying them fully. Air Marshal Harris, a bold outspoken believer in the power of the bomb, set to work to obtain the greatest possible results from his four-engined machines. They were the Stirling, the Handley Page Halifax and the Avro Lancaster. The Lancaster was a re-cast version of the Avro Manchester which had two Rolls-Royce Vulture X engines. The Lancaster, in its Mark I form, had four Rolls-Royce Merlin engines. It was also fitted in another form with Bristol Hercules engines which were employed alternatively to Merlins in several machines, notably the Wellington and the Beaufighter.

The force of four-engined bombers was a great and a courageous experiment. Except for the fact that in war all weapons tend to increase in size, there was little to encourage the Air Staff when they made their decision to go forward with these machines in 1936 to believe that they were certain to succeed. There was a school of thought—and I was within it myself—which reasoned that as the big four-engined machines would be relatively slow, they would be vulnerable both to anti-aircraft fire and to fighters. This school held that the fire from a movable turret could never be so accurate as that from the fixed guns of a fighter, firing in the line of flight of the aircraft. The result sorted out the points of interest and showed that the Air Staff had been partly right and that those who opposed the Air Staff policy had also been partly right. The big machines were not able to defend themselves sufficiently well by day to enable them to make deep penetrations into enemy territory without suffering heavy losses. But they were effective by night. So the big British four-engined bombers became night bombers, a contingency not precisely visualised by those responsible for the official policy of 1936. As night bombers, however, they proved of high value, as the section dealing with the air war will have made plain. They did suffer heavy casualties in relation to numbers produced, but they were not prohibitive casualties. These three machines, the Stirling, the Halifax and the Lancaster, were part of a forecast of the heavy bomber of the future. The other part was supplied by the United States Army bombers, the Boeing Fortress, or Flying Fortress as it was originally named, and the Consolidated Liberator. The Flying Fortress, under the Royal Air Force name of Fortress, had been in action with Bomber Command somewhat earlier in the war. The machine

was then lightly armed and had a different fin and rudder from that later used. It was tried experimentally by Royal Air Force crews and some instructive sorties were done with it; but it was then found that the aircraft's ability to fly high, which it had partly from the fact that its engines were furnished with turbo-superchargers driven by the exhaust gases, was not in itself sufficient protection. The Americans were quick and accurate in sorting out the operational information and they decided to modify the Fortress; to give it a ball turret for underneath protection, a top turret, waist guns, nose guns and a pair of tail "stinger" guns. What is more important they used in every gun position except one the .5 inch American guns. There were twelve of these .5 inch machine-guns and one .303 inch gun. The Fortress returned to the fray, therefore, a very different machine from that which had first appeared on the Western Front. It was the most heavily armed aircraft in the world and was able to deliver a weight of fire per minute greater than any other fighter or bomber. It still retained its high flying qualities; but inevitably its bomb load had been somewhat reduced. Here was an experiment as bold as that made by the Air Staff in 1936. The Americans found—as has been related—that these high-flying Fortresses were capable of looking after themselves in the face of fairly heavy fighter opposition. Their high-flying qualities cancelled out their vulnerability through size and slowness to anti-aircraft fire; and their powerful armament enabled them to reply with a veritable curtain of lead to German fighters which sought to attack. The Boeing Fortress goes down in history as the first real step (there had been many journalistic and imaginative suggestions of the kind) towards the flying battleship, a vessel heavily armed yet capable of good performance. The trend of big bomber progress was therefore clear enough; it was towards yet larger aircraft, yet more heavily armed. Such machines might work mainly by night; but where the armament was powerful enough they could also work by day. They challenged for the first time in history the supremacy in aerial battle of the single-seat fighter. And they had a development which set the seal on their advances. This was the introduction into the bombing formations detailed to pierce German territory by day, of a number of real aerial battleships; aircraft stuffed with guns and not carrying a large bomb load. These were simply protective machines, flying on the outskirts of the American formations and detailed to shoot off opposition. Enormous loads of ammunition had to be carried by such aircraft for long sorties but they proved effective and the Americans developed a technique whereby they were able to

conduct raids on enemy territory by daylight. From these two things, the massive weight-lifting British night bombers; and the faster, higher flying, more heavily armed American bombers with smaller bomb loads, the heavy bomber of the future appears. It will be bigger because it must carry more; but it will also be faster and higher flying because it must meet opposition which is powerful by day and is increasingly powerful by night. In the early stages of night bombing the night fighter had such difficulty in finding the enemy that its threat to the bomber could be ignored. But radio aids and special devices for finding enemy machines at night and for putting night fighters on to them improved so rapidly that during the early part of 1943 it was becoming plain that the bigger bombers of the future would have to carry heavier armament if their duties were confined to the darkness. Already it has been forecast that much larger guns will be used in the air in the future for the purpose of assault on ground targets where a high accuracy and a big muzzle velocity are desirable; but in air fighting itself there must also be growth in the size of armament. The big bombers will try in the future so to arm themselves that they can pour out lead on attacking fighters and screen themselves behind a curtain of fire. Bigness in both aircraft and armament is foreseen for the heavy bomber of the future. At present the 30-ton limit is approximate; 60-ton bombers are not to be long delayed and the size might go up to 70 and 100 tons though for such aircraft the advantages of great size are not quite so clear as with commercial machines, moreover the larger the bomber, generally speaking, the farther must it be based from the scene of operations so that it must use more fuel to carry its load in the result although its fuel consumption per ton miles will be lower. Twenty-four to thirty ton-miles to the gallon is the magic figure attained by bombers. It can be put (and these are extremely generalised figures which cannot be held as applicable to any individual machine) that the petrol consumption is a mile to the gallon. The bigger aircraft would do about half a mile to the gallon; but the punch they would deliver when they got to the target would be heavier. The bigger bombers, both for day and for night work, are likely to be fitted with pressure cabins and equipped in all ways to permit them to work in the stratosphere. It seems probable that, although the gun-turret will always have its uses and might indeed be an important component of some of the low-flying assault machines, much of the fire from the ultra-large bombers of the future will be directed from a "fire top" by means of remote sighting and remote gun control, the originating influence being the Messerschmitt

210 of 1942 with its pair of remotely controlled and sighted guns in the waist barbettes. Next to the big bomber we may turn to a consideration of the fighter of the future.

In all kinds of aeroplane, development is conditioned by power plant progress, but in none more so than in the single-seat fighter. Air power is built downwards from the top and depends, in the exactest sense, from the high-altitude fighters. If the aerial battleship is to be countered it will be by improvements in the single-seat fighter. Hitherto a formula has emerged for the single-seat fighter which can be traced back to the war of 1914-18. It is the single-engine, single-seat formula, with guns fixed to fire forwards in the line of flight. The Fokker monoplane with the single interrupted machine-gun began it and then there was a whole series of machines including the Morane monoplane, the Sopwith Pup, the Sopwith Camel, the Sopwith Triplane, the D.H.5, the Nieuport Scout, the S.E.5 and others. Sometimes here and there attempts were made to break away from the formula and a good example was the D.H.2 and the F.E.8, both small single-seat, single-engine machines but pushers instead of tractors. The idea here was to employ a movable front gun instead of a fixed one and to allow that to be done it was necessary to arrange the propeller somewhere else than at the nose of the aircraft—for at this time the wing mounted gun had not come into the picture owing to the use of two planes or more—the biplane or triplane—and the consequent thinness of the wings, which did not allow the convenient mounting of guns within them. When World War II broke out the single-engine single-seat fighter formula still held sway. The Gladiator and the Gauntlet by Mr. H. P. Folland had shared the position of the first-line fighters with the Hawker Fury of Mr. Sydney Camm. Then came the Spitfire and the Hurricane. All these machines; biplanes, triplanes or monoplanes, were fundamentally working to the same central conception of the fighter as a flying gun, firing only in the direction of flight. This formula was popular because it helped to overcome some of the difficulties of air firing. The complicated and large allowances and deflections that have to be made when a gun is fired from a fast aeroplane in any direction other than in the line of flight—either directly forwards or directly backwards—were eliminated by the fixed gun. Moreover the pilot could then concentrate greater attention upon the flying of the aeroplane than he could, for example, in a D.H.2 where he also had some freedom in the aiming of the gun. All these single-engine, single-seat fighters had petrol engines, first of the rotary air-cooled variety, later of the radial air-cooled variety and of the liquid-cooled in-line

variety. The liquid-cooled in-line engine, when it reached a high state of development had many claims to attention for single-seat fighters because it enabled a slim nose to house the engine. Where a powerful radial engine was mounted the nose tended to swell like a toper's and the streamline of the fuselage to be spoilt. The aim of the aeroplane designers was to provide a fuselage as small as possible in cross-sectional area providing the pilot and his essential equipment could be housed within it. This kept drag down to a minimum and was approximately the formula to which the designers of racing aeroplanes and seaplanes had worked at the time of the big international events. The Spitfire must be looked on as the highest point reached up to 1943 by the single-engine, single-seat formula. It had a slim fuselage, a liquid-cooled in-line engine and was compact and small yet carried guns enough to give it good fire power. Looking forward from the Spitfire we begin to see the possibilities which larger engines bring with them. The Republic Thunderbolt returns to the radial air-cooled engine and uses a unit of greater power than those used for fighters previously. But to accommodate this engine the front of the fuselage has swollen prodigiously and the line has been somewhat spoilt while the pilot's forward view must be somewhat restricted compared with what it would be for a smaller power unit. It is the same with the Sabre-engined Typhoon which has a huge pendulous scoop beneath the engine and presents a nose not needle-like, but more like the front of a steam-roller. If some new form of power unit were to appear the single-seat fighter would make more rapid progress. It appears at the time of writing to be reaching a peak of development with existing kinds of engine. It will continue to improve in performance and in fire power without doubt; but so long as there is no novelty in power unit, it will not make great strides and the chance of the aerial battleship catching it up in fighting prowess and even overtaking it must increase. What are the possibilities for a new kind of power unit?

The Italians announced the successful flights of the Caproni-Campini jet-propelled aircraft during the war and when belligerents announce details of technical progress it is usually safe to assume that more progress than is announced has actually been made. Jet propulsion, in fact, appears theoretically to offer opportunities for giving the single-seat fighter a new lease of life. Jet propulsion transforms the power unit, causes it to be less fixed in position, and does away with the airscrew. If jet propulsion comes into use for fighters notable increases in speeds at height and in general performance can be expected. Moreover some of the objections to a pair of thrust lines

instead of a single thrust line would disappear. The twin-engined formula is, apart from a few cases where it is used in order to give increased range as in the Lockheed Lightning for instance, not popular for fighter design because of the increased size of the aircraft, with increased wing span and therefore slower rolling rate (rolling time going up theoretically as the fourth power of the span) with lowered side vision for the pilot and wing shapes vitiated over large parts of the span. It has always in the past been better, therefore, to concentrate fighter power in a single, large, centrally disposed unit than to disperse it through two units mounted in the wings. With jet propulsion a scheme can be visualised in which a pair of jets might be used which would occupy less space than separate power units and do less damage to the sight lines of the pilot and to the wing shapes. The advantages of such a system would be that the central fuselage would then be clear for the mounting of powerful armament and for the utilisation of large transparencies in the nose so as to increase considerably the pilot's range of vision.

No occupation is more delighting to the schoolboy vestiges in the most ancient of us than the planning of the perfect fighter of the future. The present author used to spend some of his time in France in 1917 doing this in company with Oliver Sutton, who invented the Sutton harness and was a pilot of remarkable skill, and he has been doing it on and off ever since. At one time, however, the real almost caught up with the ideal. This was when the Spitfire came out in its second form. In its first form, with fixed undercarriage, it was less attractive; but in the second form it had all the good features of the later Spitfire but had not been cluttered up with the cannon and cannon stubs or with the larger radiator scoops demanded for the Rolls-Royce Merlin 61 engine or the extra-range fuel tank. But now there is room for more idealism in fighter design and the idea of introducing jet propulsion gives it scope. Start, then, with the gun group. This must include 40 mm. weapons, but they should have an even higher muzzle velocity than the Bofors gun and be designed expressly for air use. The only alternative is some kind of rocket weapon. At present there is no sign of any aeroplane appearing which would be able to resist 40 mm. shells, so that for aerial battle (as opposed to ground assault) the aeroplane of the future would almost certainly find the 40 mm. size as big as would be needed. But it is fundamental to increases in gun size that, with them, the rate of fire falls. If in-fighting between fighters is likely to continue—and there is as yet no sign of it fading out, the thing that is needed above all else is high rate of fire, the "whiplash" of lead. The fighter ought to be vulnerable to bullets of

about .5 inch size provided the muzzle velocity is high enough and consequently the gun group visualised for the fighter of the future would consist of two 40 mm. guns and two speeded .5 inch guns. Around that gun group the most perfect aeroplane possible must be built and it is assumed that the jet-propulsion system will allow the thrust lines to be out on the wings. The guns are then mounted in the central fuselage and if jet propulsion allows in the forms in which it will be developed for practical use, the pressure-generating apparatus would be centrally disposed behind them and would provide the mass for the solid anchorage of the guns, a matter of some importance when accuracy of fire at long range is required. The pilot would sit with the guns, perhaps above them as he does in the fighter version of the de Havilland Mosquito, and he would be accommodated in a moulded transparency without stiffening members similar to that employed in the first Martin Marauders. This transparency is, in effect, a near-hemisphere of transparent plastic material giving an unrestricted view in all directions. It also conforms to the best streamline shape for the nose. What of the air performance? A climbing rate from ground level of 7,000 ft. a minute is not too much to ask for with a maximum speed at rated altitude of 650 miles an hour. (One might just as well say 1,000 miles an hour, but there is that problem of compressibility drag at supersonic speed to be considered and solved and supersonic speed may not be reached until a very much more remote period than the 1970-80 period here being approximately visualised.) Powers of manœuvre might be no better than those of modern fighters and might be worse. Powers of manœuvre if expressed as the power to alter course on small radius, have been falling steadily with increasing speeds. No improvements in controls can make possible the small radius manœuvres at high speeds which introduce extremely high multiples of gravity. The problem of pilot "blacking-out" can only be partially solved. It seems doubtful if the partial solution of lying the pilot down is worth while because it restricts his vision and produces other undesirable results. Blacking-out, it seems, will be always with us. No doubt seats will be devised which will enable much higher terms of g to be taken by the average healthy fighter pilot than are possible to-day; but up among the 7 g or 8 g we must still expect to be near the practical limits. The fighter of the future will not be so manœuvrable, therefore, in terms of radius of manœuvre, as the older aircraft and in that it will merely be going the same way as its predecessors. The Spitfire is much less manœuvrable than the Camel. It has paid for its much greater speed with its manœuvre. And it looks as if speed will always and

inevitably be paid for with manœuvre. The only other point to be made about the fighter of the future is that it will be provided with a pressure cabin.

Here, then, are the vaguest outlines of the aircraft to come; the great civil air-line expresses which will put a girdle round the earth, flying at fantastic speed in the keen cold of the stratosphere, where are no bumps and no clouds; the huge load-carrying flying boats, gigantic ships of the air with the amenities of small cities; the small private air cars; the powerful bombers, armed at every point with batteries of guns; the aerial artillery machines, mounting pieces of large calibre, including rocket bombs of various sizes, capable of coming down and hitting with precise aim and heavy fire the smallest target; and the ultra-fast stratosphere fighters, jet propelled, with top speeds of 650 miles an hour and a rate of climb of 7,000 ft. a minute, flying guns capable of breaking up the strongest attacking formations. These are the instruments of air power in the future. Alike in peace and in war they will minister to the wider purposes and the expanded conditions which aviation has made possible. Strategy and commerce will be conditioned by these aircraft as they are influenced by radio communications, the cable and the telegraph and as they have been conditioned in the past by every acceleration in material transport. Let a final glance be cast now at the kind of community these aircraft will bring into being and will serve; let an attempt be made to bring together the influences that have been described and to show the effects they must have upon the life of the communities of the world.

BYRON'S sarcastic definition of democracy as "an aristocracy of blackguards" lost its popularity during World War II when democracy took on an almost holy significance among the United Nations. The aim was that the people should be their own rulers; but it is instructive to notice Professor Ernest Weekley's derivation of the word from the Greek *δημος*, cognate with a Sanskrit root meaning "divide." It was, he says, originally the territory of a community. In the original conception of a democracy there was the associated idea of the territory occupied. And the development of democracy has been largely concurrent with and conditioned by the development of territorial divisions right up to the creation of the ultimate democratic idea at the time of the outbreak of war in 1939, the Commonwealth of Nations. The community must grow in size or die. It seizes upon everything that applied science provides it with to expand. It thinks sometimes that it "invents" these vehicles or methods of communication; these aeroplanes and ships and these cables and radio systems; but the probability is that it must invent them just as the growing man must find food. It does no harm to suppose that the ingenuity of man has produced the aeroplane for no other reason than that man is always trying to make "progress" and it is often convenient to assume that man deliberately chose to work towards the development of flight, of steam transport, electric transport and the rest. But there is in fact no evidence that man has ever consciously elected to accelerate his means of travel. There is no evidence that he has considered the advantages and disadvantages of faster travel and consciously decided that he will derive benefits from it and that, in consequence, he would work upon it. It appears more probable—though we make no claim to understand these philosophical problems—that man has been groping about partly at random, like monkeys, and that his hand has happened to fall on the locomotive, the motor-car, the steamship, the aeroplane, and the various forms of rapid communication and that having found them he discovered that they could be used to minister to his mysterious compelling urge to grow, to grow from child to man, from family to tribe, from tribe to state, from state to empire, from empire to commonwealth of nations. Random notions, prolonged sufficiently, have led to useful combinations. One of the most remarkable things of the early 1943 period was the way in which public men

began to emphasise the importance of preparing for British civil aviation in peace-time. They called loudly and long for more effort to be devoted to planning the civil aviation to come; they pointed to the value of civil aviation to the British Commonwealth; they hinted at the risk that the United States would monopolise the airways of the world unless Britain did something about it quickly. Yet alongside all this agitation and parallel to it there were the no less insistent calls for the implementation of the Beveridge Report which set out a scheme for providing everybody in Britain with security from want and other benefits. It was not noticed by the professional or other philosophers that the two things had a strange conflict of ideas within them. For the call for the Beveridge scheme pre-supposed that man is master of his fate, but the call for a vast and flourishing commercial aviation pre-supposed that man is not master of his fate.

There were many people in aviation who were pressing in the strongest terms for the building up by every means in our power of a strong civil aviation, who at the same time admitted that such a strong civil aviation would ruin the countryside. That was a small but significant point. It was seen by them that the aeroplane would merely do in a more extended form what the railway train and the motor-car had done before it. It would cause extensive spoliation. It was, in fact, one of the factors in spoliation just as the winning of coal is a factor in spoliation. If Britain wished for material wealth, however, there was no choice but to see that she became the greatest air junction in the world and to ensure that English skies were full of aeroplanes both by day and by night and the English countryside even more lavishly supplied with aerodromes than during the war. To expand and increase wealth Britain must be despoiled; that is the great lesson of industrial civilisation as it has been learned in Britain. Everything that led to Britain's wealth was damaging to the earth and land of Britain. Everything that gave Britain more money than other countries produced squalor, ugliness and dirt. The black areas, the huge factories, the railways with their stations, the motor roads with their (peace-time) herds of frantic motorists smelling and smoking their way through the countryside. And now the aeroplane with its noise and its great aerodromes with three-mile runways and streamline hotels, and streamline control towers all ministering to streamline business men with streamline secretaries carrying streamlined pigskin suitcases. The call for aviation and yet more aviation was a call to build up material wealth; the call for the Beveridge Report was a call to diminish material wealth. The call for

aviation was based entirely on material wealth for it was recognised that material wealth would be the only thing that would be brought in large quantities. The call for the Beveridge scheme was a call for a happier (but perhaps an impossible) England.

The point is made not to argue if aviation is a thing which increases or decreases happiness, or whether motor-cars and trains and coal mines and oil fields increase or decrease happiness; it is made to show that there was no firm idea of how much man could be master of his fate. It was held to be possible for him to see that nobody went hungry; yet it was held not to be possible for him to see that his country was not spoiled. In one case he was a free agent and in the other he was not a free agent, but was compelled to build up his aviation and his transport and communications system. Nineteen-forty-three, then, was a time during which numerous patriotic and far-sighted men called for adequate preparations for peace time civil aviation. Committees were formed, the matter was closely debated in Parliament, especially in the House of Lords, and the Air Ministry was bidden to create a Transport Command within the Royal Air Force, partly in order to aid in the transport of troops and supplies and for increasing the mobility of Royal Air Force squadrons, but partly also to provide for a smooth transition from war flying to peace flying somewhat in the manner of 1918 when communications units of the air force worked to transport passengers and mails and pioneered several lines before the commercial organisations were fully ready to exploit them. Nineteen-forty-three, in fact, was a period of growing interest in commercial flying and the future. Dimly perhaps, yet with growing clearness as the war proceeded towards its climax, there came a concurrent appreciation that civil flying must play in peace a part at least as great, and perhaps greater, than war flying had played in war. The broader bolder picture began to be seen; the picture which displayed aviation as permeating all other things because of its "universal navigable ocean" and because of its speed. At the same time the appreciation arose that Britain must expand if she wished to continue to exist; that she must expand or die. Perhaps this appreciation was not voiced in so many words; but it was there. It was behind the increasingly urgent and anxious demands for the development of civil flying in readiness for the coming of peace. "Instinctive" desires were making their impression. They were turning the minds of men on the way in which, when war ended, they could reach out farther than they were formerly able to do. There was a vague understanding that material wealth must be won by the use of all the

means which applied science made available and that it was not within the scope of man's then existing potency to choose his world of the future. That was determined for him. So aviation was going to be a necessity to the British Commonwealth of Nations and at the same time it must in the end lead to the swallowing up of that Commonwealth of Nations within a larger community.

Great things are now in the offing. The war has been a warning and also a stimulus. It has shown that the plundering of the earth may bring a compensatory movement into being in which human beings themselves are plundered in turn and the earth turns on those who have been plundering it and hits back with war and famine. The war also limned the part that aviation must play in the affairs of men and how it permeates other military and commercial activities and must neither be shut off on its own or frittered away for the benefit of other modes of transport. The war produced the balanced force of all the arms and with it the balanced view of the part aviation must play.

It has been necessary to enter a field of philosophy without adequate authority because it has been necessary to try and see the basic causes of aeronautical progress. And if the reading be true that man does not consciously choose to develop transport vehicles of any kind but is driven to their development and use by a need for growth, then it may perhaps follow that the possibility of war must remain while there is scope for community growth. One official reason given by Germany for the war of 1939 was that Germans needed more living space. The reason may not have applied to them, but it is a reason which may have some influence on the outbreak of war. If the compulsion to grow is artificially restricted, it may be that conditions arise which favour an outbreak of war. And if that be true then it follows that while there remains scope for some communities to expand at the expense of others, there will also remain a risk of recurrent wars.

The tribe fights the tribe in order to take territory and people and to expand. The nations fight the nations for the same reason and so on to the large agglomerations of nations which met in conflict in the war of 1939. In brief it seems that as it may not be within human choice to say whether they will progress or not, whether they will preserve themselves as a pastoral community or become an industrial one, so it may not be within human choice to say whether they will fight wars or not. The entire process may be as "natural" and as difficult to interrupt as the process of growth. We come

therefore to the conclusion that Britain must try to advance in the air. It is not a question of whether Britain is predatory or whether she wishes to gain wealth and territory at the expense of others. It is merely the natural response to a natural stimulus. Britain must advance in the air because advance in the air is intimately concerned with advance in military strength and commercial strength. If Britain does not advance in the air, others will do so and Britain must in the end be overrun and obliterated. Britain has the choice, which is the choice of all countries, whether to proceed with the development of aviation for peace and for war or to disappear as a great power and perhaps as an independent nation. But let it not be thought that it will be possible for Britain to take her place in the air without fighting for it. The dreams of a smooth, just, peaceful international co-operation are not more than dreams. "And he is dead who will not fight; And who dies fighting has increase." That, as I see it, is the truth. It is useful as well as entertaining to try and peer into the future. But so doing the effort must be made to distinguish between what is wished and what appears likely. The world of the air that is to come will not, at this remove, be a world in which there will be no more war and no more competition. When the world resolves itself and smoothes out its troubles and dissensions and comes together into one single, comfortable, safe, peaceable community, the world will die.

I tread now on dangerous ground. If it be true that the ultimate community expansion, which will occur when the world is tied together by improving communications and transport systems, into a single, unified whole, will be the beginning of dissolution and death, then what comes between? What are the stages to be seen if the hypothesis of the expanding community put forward here is right? Let us transport the pattern of the past to the future and work according to the words of Warwick in the Second Part of *King Henry the Fourth*: "There is a history in all men's lives, figuring the nature of the times deca's'd; The which observ'd, a man may prophesy, With a near aim, of the main chance of things As yet not come to life, which in their seeds And weak beginnings lie intreaured. Such things become the hatch and brood of time." The pattern of the past is of expanding communities, seizing upon every advance in applied science to minister to their urge to expand, seeking such advances in applied science partly because of that urge to expand. The horse and the tribe; the wheeled vehicle and the nation; the ship and the empire; the aircraft and the commonwealth of nations—each step inevitable, instinctive, blindly followed under a compulsion little understood and entirely uncontrolled and perhaps uncontrollable.

And at each stage the war, which clears the way when two communities are alike using new systems of communications and transport to grow, the war which determines which shall grow and which wither and make way for the other which will reach the sun and light. It follows from such a picture that each war must be bigger than the one before it; that the means of transportation which have in their way brought the war about also influence and shape it according to their fashion. The "nature of the times deceas'd" is surely clear enough. And if, observing it, we can indeed prophesy with a near aim of the main chance of things as yet not come to life, we must say that the next stage will be the emergence, soon or late, of the greater community than the commonwealth of nations; perhaps the continental community; the European; the American; the Asiatic. The existing groupings will grow to these larger groupings as aviation prospers and provides the means of growth. And then there must be—again if the past is a sure guide—another, greater clash, a tremendous war of continents in which yet vaster forces will meet in fearful struggle and the earth's resources will be plundered more frantically in the struggle to exist and existing to expand. Perhaps there may be yet another stage; the war of hemispheres, in which two gigantic communities will meet in the ultimate struggle for domination of the world. Looking over these steps in the development of man, one guesses then that the major involution must follow. There will have been growth to the limits set by the mechanics of the universe and there seemingly must follow, decay. There must follow a breaking up of the giant community into the smaller sectional pieces; a destruction, perhaps by some gigantic world catastrophe, some breakdown of the agricultural basis of life and widespread famine, of the giant community's mode of life, of its mechanisms and mechanical achievements so that the community life cycle may begin again.

Reading these things, then, we see the future as growth through transportation and communication, growth through extension in peace and through fighting in war, growth to the limits set by the structure of the universe; a succession of greater and more powerful and more mechanically skilled and knowing communities, with at intervals a trial of strength between ever larger combinations, to the final resolution of world conflict in the single world community which, having come through fearful trial and gigantic war, must in itself bear the seeds of its own decay so that the life cycle may start again for the world community as it starts again in the decaying body of an animal. It may be considered presumptuous that the present author, a rude mechanical, absorbed in the cruder problems of mechanic flight,

should thus speculate on world events and world trends; but the war of 1939, with its continuous and urgent insistence upon the aeroplane—upon the latest and fastest form of transport and travel—and upon radio—the latest and fastest form of communication—does appear to indicate a fundamental relationship between these modes of travel and communication and the pattern of world events. The newer and faster form of transport is at once a means of expanding and also a means of fighting for space in which to expand. When World War II ends we must be making ready for World War III and that not because we want to have another world war but because there is behind our acts this compulsion to expand and that brings with it the need for periodical trials of strength between the growing communities as they struggle for more living space and larger spheres of influence. The body politic grows as does the body physiological. After World War II bigger communities than before will emerge. Perhaps the English-speaking world will come together into a single community; perhaps the European world will come together in a single community in the fashion faintly forecast by Briand. Perhaps some as yet unforeseen combinations will occur. The field for speculation as to the future communities of the world is almost unlimited. Only this is certain, that the main communities will be bigger, will cover greater areas of the earth, will have within their power greater parts of the riches of the earth, and therefore greater scope for plundering the earth, than before World War II broke out. Then the United States of America, the British Commonwealth of Nations and the Union of Soviet Socialist Republics were the great communities with France, Germany, Italy, Japan, and others in descending sequence next to them. War came because there was the urge upon some of these communities to grow and perhaps fundamentally upon those who did not start the war as well as upon those who did. Germany, as has been suggested, may merely have *voiced* the demand for living space which actuated others as well, though not to their knowledge. The vast conflict started and spread and with it greater combinations of nations came into existence. The United Nations became United for war purposes and included the British Commonwealth, the United States of America and Soviet Russia, while on the other side a like giant combination, part Asiatic, part European arose. The world plunged into flame, the brazen frenzy started, and as it rose and tore and hacked at the careful peace compilations of political, economic and military existence, it broke open the way for expansion. It is astonishing therefore, that those who, in Britain, were working to interest

the Government in commercial aviation and its post-war prospects, were often parochial in their approach. They expressed fear of American domination of the world's air lines and asked for measures that would enable Britain to compete with America, her companion in arms whom they seemed to visualise as their chief competitor in commerce. A few voices were raised on the larger issues. In the House of Lords, for instance, Lord Sempill, with long aviation experience behind him, elected to advocate a joint Transport Command, incorporating both British and American air forces, as a preliminary and war-time measure designed to aid the war effort while at the same time providing some slight preparation for peace transport on a co-operative line between Britain and America. His scheme was in the direction of the larger community with Britain and America working together. It was a scheme suited to the time and in accordance with the signs. It would have allowed for the expansion that was showing itself as an inevitable consequence of the war and it would at the same time have increased the war effectiveness of the air transport services. Apart from this proposal, however, there were few signs as the great testing-time of 1943 approached, of a fuller and ampler grasp of the scope and meaning of flying in world affairs. There were still the same arguments about the ton-mileage of air transport against sea or land transport, the same questions about economics. There were arguments about the "freedom of the air" and about monopolies. No great figure arose to give the plans for British civil aviation a lead. The dim and misty figure of a short stocky man with an eyeglass might have appeared. He would have poured scorn upon the littleness of the British conceptions and actions. Sir Sefton Brancker, blunt-speaking, full-living individualist was a man who, had he not lost his life in the most spectacular air crash in history, that of the airship R.101 near Beauvais, would have given a lead. But no man in his likeness arose. There were many who worked hard and who tried hard; but they had not the unselfish vision of Brancker, they had not the faith and the forceful determination. They niggled where he would have moved in big strides. It is one of the saddest things on which to conclude these words that in 1943 when civil air transport was discussed in Britain, when the war was working towards its climax, none arose who showed that he held the wider view or understood that aviation must minister to the expanding community and that the expanding community must use aviation or die. Instead of these grander visions there were arguments about subsidies and monopolies. Such things were of small, almost negligible importance. The thing that stood

out was that Britain must use air transport or die and that the ideal of a form of world air transport from which competition had been eliminated was unattainable. There remained scope for further expansion and while such scope remained, until the time when the world was one community, there would be competition and there would be war. The bolder course would be to work for collaboration with the greatest air transport country, the United States of America, and with them to set up an air transport system which would frankly compete with all others. Sir Archibald Sinclair, sincere, honest, scrupulous, stuttered out his speech accompanying the token air estimates in Parliament in March 1943, and announced that a Transport Command had been formed in the Royal Air Force. But it became clear that it was a small conception, designed for war alone, and apparently intended to restrict its operations immediately war ended. Only in the creation, towards the end of 1943, of an Empire committee to go into air transport questions for the whole of the British Commonwealth, was there a sign of the real vision.

Flying is not a blessing. It is not a curse. It is the nourishment which permits the communities to grow. Already in the war of 1939 it has begun to show how it sets about allowing for this growth. But that is a beginning. There will be afterwards a busy building up of the larger communities which must eventually merge. Brought together as closely as the *counties* of two hundred years ago, the *countries* served by aviation must bind themselves together in order to fulfil their destiny. And when they bind themselves together and increase their power they must go to war if others seek to restrict their growth. Unless a new "discipline of peace" (to quote Dr. Barlow) is created, World War III must come. It will be hateful to contemplate and it will be generally resisted. But if there is any truth in the belief that communities are compelled to grow it must come. It must blast out the way to the next great agglomerations and the next great commercial clash. Only when this other world war has been fought out will there be the comfortable evening in which men will be for a time content to live without struggle and without ambition. It will, however, be evening.

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